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CONTENTS

KRANTZ—The Acaridae: A recapitulation 157
DOUTT—Heterogony in Andriscus crystallinus Bassett 167
ROSENSTIEL—A gooseberry cambium miner 170
WASBAUER—Taxonomic and distributional notes on some western spider wasps 171
NELSON & BARR—New synonymy in the Buprestidae 178
BUCHELOS & PRITCHARD—Amblyseius similoides, a new predacious mite 179
JERATH—Distribution of Aphodiinae in Oregon 183
USINGER—Observations on the biology of Chiloxanthus stellatus (Curtis) and C. arcticus ((Sahlberg) 189
STAGE—First North American host record of the adventive wasp, Chrysis fuscipennis Brullé 191
PRITCHARD—Two new spices of catochine gall midges, with a new key to genera of the Catochini 195
RYCKMAN & OLSEN—Paratriatoma from the mainland of Mexico 197
HOTTES—Rhizomaria piceae Hartig new to America 199
NUTTING—Notes on the occurrence of four adventive earwigs in Arizona 202
PARKER—A systematic study of North American Priononyx 205
BOOK REVIEW 182
ZOOLOGICAL NOMENCLATURE 188

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THE PAN-PACIFIC ENTOMOLOGIST

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The Pan-Pacific Entomologist

Vol. XXXVI October, 1960 No. 4

THE ACARIDAE: A RECAPITULATION

(Acarina: Sarcoptiformes)[1]

G. W. KRANTZ

Oregon State College, Corvallis

Although the mite family Acaridae is a comparatively small one as regards numbers of species, it is nevertheless one of the most successful groups of animals on earth. Through their unique methods of dispersal, omnivorous food habits and phenomenal reproductive rate, acarids have become well established throughout most of the world. Several species are found commonly in stored grain and grain products where they cause injury by their feeding and by creating, in many instances, difficult contamination problems. Preserved meats, cheeses, bulbs and dried fruits also are liable to infestation by acarids. The majority of species, however, are found living as saprophytes or fungivores in soil, litter, or in the nests of mammals or birds.

The Acaridae may be described as opaque, weakly sclerotized mites ranging in size from 400 to 2000 microns, and completely lacking in respiratory and complex sensory structures. The gnathosoma (fig. 1) is small and compact, with a pair of maxillary palpi closely appressed to the hypostome. The chelicerae are the most prominent gnathosomal feature, being heavy and coarsely chelate distally. The idiosoma is divided by a transverse apodemal suture into a propodosomal and hysterosomal area, each of which bears two pairs of legs in the nymphal and adult stages. The propodosoma has a weak anterior dorsal plate which is all but lost in many species and a more or less constant series of dorsal setae and sensory organs. The rostral setae (fig. 1, r.) are inserted at the anterior edge of the dorsal plate. They usually are quite strong and may or may not be weakly pectinate. The cervical setae (fig. 1, c.) may be found either at the anterior lateral corners of the dorsal plate or on the mediolateral borders of the plate. They generally are small and may be pectinate. The inner and outer propodosomal setae (fig. 1, i.p., o.p.) are inserted transversely across the posterior portion of the

[1] Invitational paper presented at the annual meetings of the Pacific Branch of the Entomological Society of America, June 24, 1959, at Sacramento, California. Technical paper No. 1281 of the Oregon Agricultural Experiment Station.

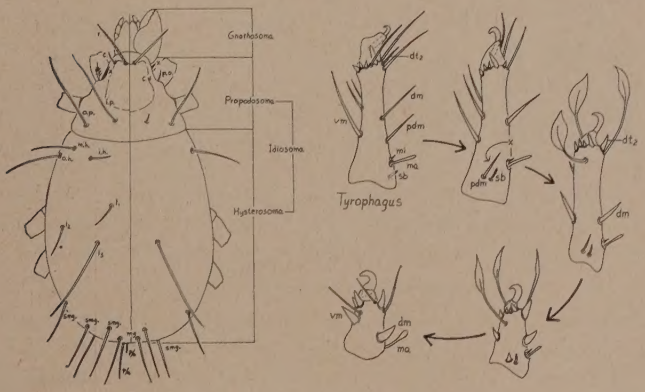
propodosoma. These setae are highly variable and, in some species, the inner pair may be reduced or absent. Grandjean's organ (fig. 1, x) is a tiny propodosomal structure that is thought to be sensory in function. The organ assumes a tree-like form in some acarids and lies in a body depression just anterior to coxae I, where it often is difficult to detect. In other species it is a seta-like projection which is easily seen. Posterior to Grandjean's organ is a pseudostigmatic spine (fig. 1, p.o.) which may be pectinate or smooth. The dorsum of the hysterosoma commonly bears ten pairs of setae, with reduction occurring in certain genera. Three pairs of humeral setae are found on the anterolateral portion of the hysterosoma (fig. 1, o.h., i.h., m.h.). The inner humeral setae always are the shortest of the three when all are present. Both the middle and inner pairs are completely lost in some species. The lumbar setae (fig. 1, l_1, l_2, l_3) occupy the middle area of the hysterosoma. Only the third lumbars are found in virtually all acarids. As many as seven pairs of setae may be inserted at the posterior margin of the hysterosoma. These are the marginal and all but one of the sub-marginal setae (fig. 1, mg., smg.). Although inserted ventrally, the post-anal setae (fig. 1, p/a) are considered by many authors to be a part of the marginal-submarginal setal complex.

Ventrally, epimera I are fused at the midline, while epimera II-IV are free medially (fig. 2a, op). The genital opening of the female lies between coxae III and IV while that of the male (fig. 2b) usually is found between coxae IV. Two pairs of genital discs flank the genital area in both sexes, and a copulatory sucker is located on either side of the male anal slit. The ventral setae are fairly constant and are considered to be of little importance taxonomically.

While most mites have six-segmented legs, acarids have only nve. It is generally assumed that the trochanter has been lost and that the coxa is joined directly to the femur. Possibly, however, the true coxal segments have become fused with the venter, with only the epimera to mark their former positions. Thus the so-called coxa of acarids may, in reality, be the trochanter. Tarsus I (fig. 4) bears several setae, some of which are sensory in function. Nesbitt (1945) has emphasized the importance of these setae in determining phylogenetic development of acarid genera. Tarsus IV of the male bears two (occasionally

one) raised suckers (fig. 2c) on its dorsal surface, which serve to hold the female during copulation. All tarsi terminate in a sessile empodial claw which may be seated in a membranous caruncle. In the genus *Lardoglyphus*, true claws persist in the females, while the male of only one species, *L. zacheri* Oudemans, retains true claws on tarsi I and II.

Taxonomically the Acaridae has proven a confusing problem to the several acarologists who have studied them. Despite the efforts of such well-qualified persons as Berlese, Canestrini, Banks and Oudemans, the systematics of the Acaridae remained enigmatic until relatively recently. It is not surprising that errors occurred in the early works on this group. Lack of clear-cut taxonomic characters coupled with inadequate optical equipment resulted in a number of artificial and highly unstable systems of acarid classification. Rather than treating the Acaridae as a natural, integrated group, many early workers expressed relationships on a suprafamilial basis, creating families on the strength of what we now consider to be tribal or generic characters.



Explanation of Figures

Fig. 1. Diagrammatic representation of the dorsum of an acarid mite, showing extremes in body setation. Fig. 4. Variations in tarsi I of acarid mites, showing developmental trends in setation and segmental length. Vm—ventral median seta; sb—sub-basal seta; ma—macrosense seta; mi—microsense seta; pdm—postdorsal median seta; dm—dorsal median seta; dt_2—second dorsal terminal seta (Adapted from Nesbitt 1945).

The ensuing confusion in species separation led to numerous synonymies, many of which are yet to be resolved.

Realizing the inherent artificiality in the existing systematic concepts, Zakhvatkin (1937, 1940) presented a scheme of acarid classification in which the family Acaridae (then Tyroglyphidae) was extended so as to include several families of earlier authors. Zakhvatkin divided the acarids into two sub-families, both of which were further divided into tribes and genera. He separated his subfamilies through the relative positions of the cervical setae, size and condition of body and tarsal setae, size of the empodial claw, and the presence or absence of a caruncle. Tribal and generic characters were similar to those used later by Nesbitt (1945), with the position and modification of setae on tarsus I being of major importance in the separation of both tribes and genera. The resulting classification was, to quote Nesbitt, "the most satisfactory yet devised for demonstrating relationships in the family." The almost universal acceptance of Zakhvatkin's work by subsequent authors on the Acaridae tends to support Nesbitt's statement.

In 1955, Yunker proposed a classificaton of the supercohort Acaridiae, the group in which the Acaridae occurs. He observed that a natural separation of parasitic and non-parasitic forms could be justified on morphological grounds. Yunker divided the Acaridiae into the cohorts Acaridia (free-living forms), Psoroptidia (parasitic forms), and Ewingidia, a monogeneric intermediate form possessing morphological attributes of both the Acaridia and Psoroptidia. The presence of genital suckers in the Acaridia served to separate it from the remaining cohorts.

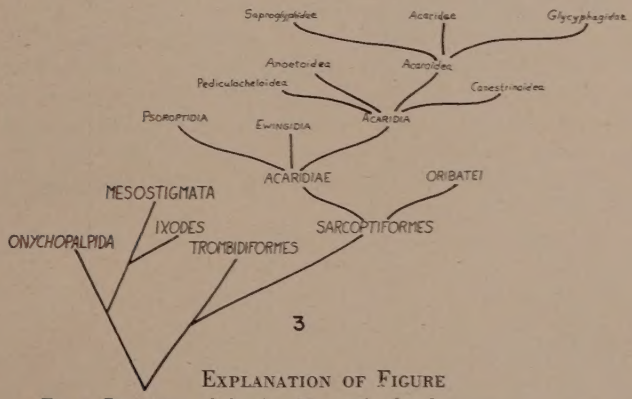
The Acaridia comprises four superfamilies (fig. 3), of which only the Acaroidea and the Anoetoidea possess the well-developed empodial claw so typical of members of the family Acaridae. The Anoetoidea differs from the Acaroidea, however, in usually having a transverse rather than a longitudinal genital slit, and in having highly modified palpi (Hughes 1958; Scheucher 1957).

While some authors prefer to think of the Saproglyphidae and Glycyphagidae as subfamilies in the family Acaridae (Türk and Türk 1957), these groups ordinarily are considered to have individual familial status. Unlike typical acarids which possess sessile claws, both saproglyphids and glycyphagids have distinct

pretarsi. In neither group do the males have anal or tarsal suckers as found on male acarids.

As presently conceived, the Acaridae consists of two subfamilies — the Acarinae Nesbitt and the Rhizoglyphinae Zakhvatkin. Structurally the Acarinae are of small size (400-700 microns) and are secondarily homeomorphic. The propodosomal setae (fig. 1) are well-developed and the legs are slender. The cervical setae are inserted on the anterolateral angles of the dorsal plate. Tarsus I is equal to or longer than the combined genu and tibia, and the tarsal setae are simple. The claws are quite weak but the caruncles are strong and distinct. The Rhizoglyphinae, on the other hand, are large mites (700-2000 microns) and are secondarily dimorphic, in that many of the body setae of the male are longer than those of the female. Some of the propodosomal setae may be reduced or absent (fig. 1). The cervical setae are inserted on the mediolateral borders of the dorsal plate. The legs are short and stout, with tarsus I rarely as long as the combined genu and tibia. Some of the tarsal setae are absent in rhizoglyphines, while others are modified into stout spines. The claws are robust, and the caruncles are poorly developed or absent.

As mentioned earlier, because of the absence of other major morphological features in the family, a great deal of emphasis has been placed on the setation and shape of tarsi I in the tribal and generic classification of acarids (fig. 4). It is impossible



EXPLANATION OF FIGURE

Fig. 3. Derivation of the Acaridae and related groups.

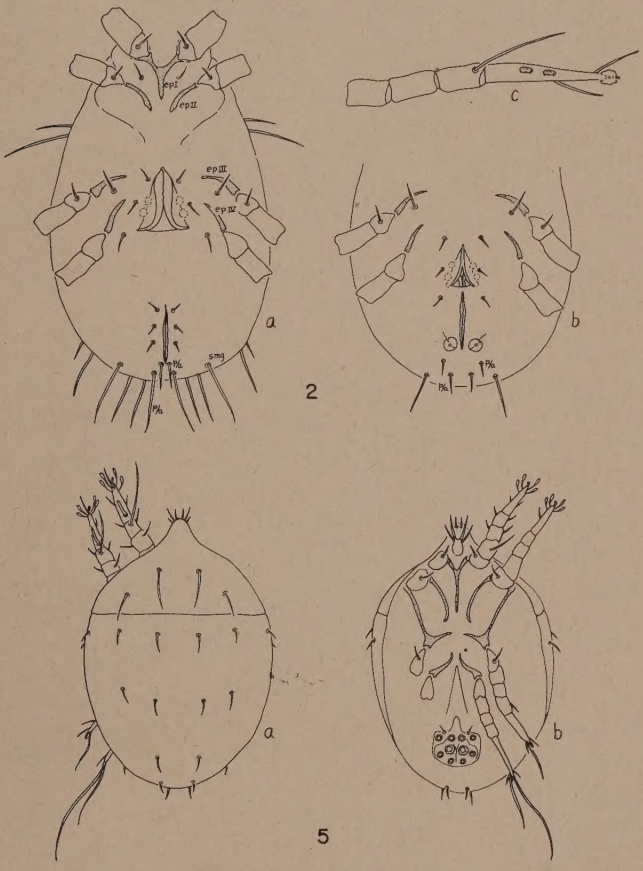
to say what the primitive condition of the tarsus is, but if we can assume the correctness of Oudemans' application of the theory of recapitulation to the Acaridae (1924), the genus *Tyrophagus*, subfamily Acarinae, appears to be the most primitive acarid group. Thus the condition of tarsus I of this genus might be considered primary for the family. Typically, then, tarsus I is equipped with 12 setae, five terminal spines, and an empodial claw and caruncle. In many species, various setae migrate to new positions on the tarsus and often change in shape or size. As these changes become more complex, the tarsal segment itself is seen to become shorter and stouter than in the original primitive condition. Correlated with these progressive alterations is a loss of some of the tarsal setae and an increase in the size of the empodial claw. By using this progression in conjunction with a correlated reduction or loss of body setae (fig. 1), Nesbitt (1945) has traced the relationships and phylogeny of acarid genera. He concludes, among other things, that the Rhizoglyphinae have evolved from the more primitive Acarinae.

Separation of the Acarinae and Rhizoglyphinae is possible on ecological as well as on morphological grounds. Acarids collected from low moisture substrates such as dried fruit or stored grain will almost invariably prove to be members of the subfamily Acarinae, while those acarids found in rotting bulbs, mold or any other high moisture habitat usually will be rhizoglyphines.

While acarids lack apparent defensive structures or the speed necessary to elude the many predators associated with them, still they persist in what oftentimes amounts to astronomical numbers, primarily by out-producing their enemies. Development from egg to adult in some Acaridae may take as little as eight days under conditions of optimum temperature and moisture, and females have been observed to lay over 100 eggs during their lifetimes (Garman 1937).

The acarid life cycle consists of the egg, larval, nymphal and adult stages ordinarily found in other mite groups. The eggs are large and heavily yolked, and are extruded by the female in a haphazard fashion as she crawls over the substrate on which she is feeding. The hatching larva is hexapod rather than octopod as in the succeeding stages. The larva soon becomes quiescent and molts to the first nymphal, or protonymphal, stage. The

protonymph feeds actively for a short time and, after a period of quiescence, transforms to the second nymph. The second nymph may be distinguished from the protonymph by a distinct size differential, as well as by differences in setal patterns. The second nymph resembles the adult in certain respects but sexual



EXPLANATION OF FIGURES

Fig. 2 a. Diagrammatic representation of the venter of female acarid mite. b. Diagrammatic representation of the venter of a male acarid mite. c. Leg IV of a male acarid mite, showing dorsal tarsal suckers. Fig. 5 a. Dorsum of a typical acarid hypopus. b. Venter of a typical acarid hypopus.

characters usually are not clearly defined until the adult molt is attained.

Quite often an extra nymphal stage occurs between the first and second nymphal instars. This form is referred to as the hypopus, or hypopal stage (fig. 5). Because of its time of occurrence in the nymphal sequence, the hypopus is commonly thought of as the second nymphal stage, or deutonymph. When the hypopal stage occurs, the typical second nymphal instar appears at the hypopal molt and is called the third nymph, or tritonymph. Morphologically, there is no observable difference between the typical second instar and the post-hypopal third instar.

The acarid hypopus is peculiar in that it differs so radically from the other acarid instars. It is round or oval in shape, usually darker in color than the preceding or succeeding stages, and is distinctly flattened dorsoventrally. As with the other nymphal forms, eight legs are present but they may be very short. The tarsi often are decorated at their distal ends with a number of elaborate setae. Mouthparts are absent, and the gnathosoma is represented by a tiny anteroventral body projection which may be the developing palpi. A plate of disc-like suckers is located on the ventral side of the hypopus, between or behind the fourth pair of legs. It is by means of these suckers that the hypopus adheres to passing insects, birds or rodents and is carried from one area to another.

Although the hypopal stage has been studied by scores of investigators, the reason or reasons for its sudden and erratic appearance has yet to be defined or proven. According to Michael (1901), eight different theories had been advanced as of the year 1884 concerning the origin of the hypopus. Various workers thought of the hypopus as an itch mite, a separate family of adult Acarina, an immature stage of the predatory genus *Gamasus*, an external parasite, or the male, or male and female, mites of the genus *Tyroglyphus*. In his presidential address before the British Microscopical Society in 1894, Michael described the observations of one worker, who decided that the hypopus was "a ferocious creature which attacked other mites from below, ate its way in, and then devoured its host, leaving only the skin." As pointed out by Michael, the absence of mouthparts in hypopi did not seem to trouble the investigator. Haller (1880) suggested that the hypopus is a protective covering which is produced

when the immediate food supply is exhausted and travel to a new location is necessary. Megnin (1873, 1874) believed the hypopus to be a heteromorphous adventitious nymph which develops only when adverse environmental conditions forces its dissemination. Michael confirmed Megnin's observations on the origin of the hypopus but found that formation of the hypopal stage is not necessarily dependent on environmental conditions. Other experimenters have attributed hypopus formation to moldy or dirty food media (Sokolov 1935; Scheucher 1957), to some unknown "innere Faktoren" (Türk and Türk 1957), or to the presence of two distinct types of nymphs in an average population, one of which will transform to hypopi regardless of environmental conditions, and one which passes into the hypopal stage only when deprived of suitable food (Schulze 1924). Türk and Türk (1957) and Scheucher (1957) feel that lack of moisture in the habitat is a factor which is of primary importance only in that the lack of moisture in the food medium prevents feeding, which in turn leads to hypopal formation.

It can be seen, therefore, that the hypopus question is still open to debate. Until an explanation can be found for this phenomenon, it may be assumed that the hypopus is a form primarily adapted for dissemination and for resistance to environmental inconstancies.

The hypopal stage is by no means limited to the Acaridae. The Saproglyphidae and Glycyphagidae in the Acaroidea, and the Anoetidae in the Anoetoidea have hypopal forms, as do certain of the feather mites in the superfamily Analgesoidea. Further biological studies probably will reveal that hypopi occur also in other Acaridae.

The purpose of this paper has been to summarize some of the more important taxonomic and biological aspects of the Acaridae. It should be realized that, because of the introductory nature of this discussion, many of the incidental phenomena relating to the family have not been included. Much has already been learned, but the Acaridae still offer a major challenge in the field of acarological research.

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HETEROGONY IN ANDRICUS CRYSTALLINUS BASSETT

(Hymenoptera: Cynipidae)

RICHARD L. DOUTT

University of California, Albany

Heterogony is suspected to exist in certain California species in the genera *Loxaulus* and *Antron* (Weld, 1957), and was proved to occur in *Dryocosmus* (Doutt, 1959), and *Callirhytis* (Lyon, 1959). Recent studies now include the genus *Andricus* among those exhibiting an alternation of generations.

Fallen leaves of the deciduous blue oak, *Quercus Douglasii* H. & A., bearing galls of *Andricus crystallinus* Bassett were collected on Mt. Diablo, Contra Costa Co., California on February 4, 1959. The fact that many of the galls showed emergence holes indicated a strong possibility that an alternating generation must exist for no leaves are on the trees in February and it seemed logical that the emerging females would not hibernate but instead would oviposit in some part of the dormant tree. Adult female *Andricus crystallinus* began emerging in the laboratory on February 5 and were caged on small dormant seedlings of *Q. Douglasii* on February 6. Oviposition occurred immediately in the tight leaf buds. The seedlings were then kept under daylight fluorescent lamps at a constant temperature of 78° F. and a relative humidity of 65%. Within five days the buds had opened and the leaves were rapidly expanding. On February 16 (ten days after oviposition) small, green, conical, monothalamous galls with laterally projecting cottony fibers (Figure 1) were evident on the leaves. On February 23 (17 days after oviposition) emergence of both male and female *Andricus* occurred. These adults of the bisexual generation, morphologically distinct from the unisexual or agamic generation of *A. crystallinus*, oviposited in the fully expanded leaves of the blue oak. It is from these eggs that the unisexual generation is formed in the pinkish, crystalline galls (Figure 2) which are so characteristic of this species in the summer months. In this experimental study the unisexual galls required 130 days to reach their full development on the leaves.

Since the bisexual generation has not been previously recognized, a brief description of the morphological and biological characteristics of these insects is appropriate.

ANDRICUS CRYSTALLINUS Bassett, bisexual generation.

Female.—Body entirely black, legs except coxae golden brown, coxae

black. Antennae dark brown except basal four segments which are golden. Maxillary and labial palpi pallid. Wings hyaline with slight infuscation near break in median vein, areolet small, veins smoky brown. Head viewed dorsally nearly as wide as thorax, but frons very short. Surface minutely punctate with scattered short hairs. Eyes and ocelli jet black. Antennae with 14 segments. Mesoscutum smooth, shining, parapsidal sutures well developed, no median suture. Scutellum dull, rugose, clothed with scattered hairs. Mesopleura smooth, shiny. Abdomen polished, few scattered hairs near petiole, larger than head and thorax combined, segments all visible dorsally, segment II forming less than one half of the abdomen, ventral spine slender, ovipositor brown. Tarsal claws toothed.

Male.—Color as in female except all antennal segments dark brown, abdomen near apex tends to be more brown than black as in female. Compound eyes large, reaching three-fourths way down head. Frons wider than female. Third antennal segments distinctly longer than fourth; (this is not so apparent in the female). Antennae with 15 segments. Abdomen smaller than thorax. Areolet present but small. Legs more slender in male than female.

The female of the bisexual generation is readily distinguished by color and size from the unisexual or agamic female which is basically reddish amber with black areas on portions of thorax, head, and abdomen, and of larger size. The mesoscutum of the agamic female is minutely punctate, dull, clothed with numerous white hairs. Segment II of abdomen is quite large, forming nearly 2/3 of the abdomen. Wings tend to be slightly infuscated near base.

Gall.—The galls in which the bisexual generation of *Andricus crystallinus* develops are found mostly on the upper surface of leaves, singly or in small groups. The color is green with straw colored apex. The gall has many long cottony, white hairs which project laterally and are longer than the greatest dimension of the gall. The gall is conical in shape, and distinctly canted to one side rather than being erect (Figure 1). The length is approximately 2.5 mm. with the base 1.0 mm. tapering to the tip. The position of the gall is indicated on the opposite (usually lower) side of the leaf by a pale colored elliptical swelling. Emergence takes place from uppermost side of the slanted, conical gall. The gall has a single chamber.

Host.—The insects described herein were reared on *Quercus Douglasii*, but since the unisexual generation has been taken on other white oaks including *Q. dumosa*, and *Q. garryana* it is likely that the bisexual form may be found on them also.

Plesiotypes.—The specimens used in the above description

EXPLANATION OF FIGURES

Figure 1. Typical gall produced by the bisexual generation of *Andricus crystallinus* Bassett. Gall measures 2.5 mm. in length and 1.0 mm. at base.

Figure 2. Cluster of galls produced by the unisexual generation of *A. crystallinus*. Dimension of this gall cluster approximately 15 mm. wide by 12 mm. high. Photographs by F. E. Skinner.

were reared in the laboratory at Albany, California, from agamic females obtained in galls collected at Mt. Diablo State Park, February 4, 1959. The series consisted of females and males. These specimens are housed in the collection of the Department of Biological Control, University of California, Albany.

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A GOOSEBERRY CAMBIUM MINER

(Lepidoptera: Opostegidae)

In May 1956, a pest new to western North America was found doing serious injury in a commercial gooseberry patch near Forest Grove, Oregon. The larvae were identified by the U. S. National Museum as *Opostega* sp. near *nonstrigella* Chamb. The larvae of the moth were making linear feeding mines in the cambium of the gooseberry shoots. One or both ends of the mines recurved in a half circle so that each mine made a pattern of two parallel lines from four to ten inches long. Injured gooseberry plantings infested by the miner have been found generally in the Willamette Valley of Oregon.

The original description of *O. nonstrigella* by Chambers[1] gave gave no host or type locality. Grossenbacher[2] described the injury and gave life history notes from the Hudson Valley of New York. He thought a fungus was involved in the injurious effects but could not confirm the relation. In 1919, Caesar[3] reported it as injuring gooseberries from Burlington, Ontario.—R. G. Rosenstiel, *Department of Entomology, Oregon State College, Corvallis.*

[1] Chambers, V. T. 1881. New species of Tineina. Cin. Soc. Nat. Hist. Jour. 3(4):289-296.

[2] Grossenbacher, J. G. 1910. Medullary spots: a contribution to the life history of some cambium miners. N. Y. Agr. Exp. Sta. Tech. Bul. 15. Geneva.

[3] Caesar, Lawson. 1919. Insects as agents in the dissemination of plant diseases. 49 Ann. Rep. Ent. Soc. Ont. 1918:60-66.

TAXONOMIC AND DISTRIBUTIONAL NOTES ON SOME WESTERN SPIDER WASPS

(Hymenoptera: Pompilidae)

MARIUS S. WASBAUER

California Department of Agriculture, Sacramento.

The following study is based on material which I was allowed to examine through the kindness of the following individuals and the institutions which they represent: Mr. Jerry A. Powell, California Insect Survey, University of California, Berkeley (C.I.S.); Dr. E. S. Ross, California Academy of Sciences, San Francisco (C.A.S.); Mr. H. H. Keifer, Bureau of Entomology, California Department of Agriculture, Sacramento (C.D.A.). Material from my own collection (M.W.) was also employed.

Dipogon (Dipogon) leechi Wasbauer, new species

Female.—Length 5.6 mm. Forewing 4.5 mm. Head and body entirely dull, clothed with a rather long, dense, appressed pubescence, silvery with vague golden reflections on head, golden on pronotum, mesonotum and scutellum, elsewhere silver-gray, particularly long on abdomen. Appressed hairs of pronotum separated by an average of .3 their length. Integumental color black, antennae testaceous, first three segments infumated dorsally; mandibles distad of middle, front tibiae below and all tarsi testaceous; trochanters each with a narrow, apical ivory band on inner side. Integument minutely granulose, nearly impunctate. *Head:* slightly broader than long, facial distance .92 the transfacial distance; compound eyes somewhat convergent above, upper interocular distance .85 the lower interocular distance; ocelli in a compact, nearly right triangle, posterior ocelli nearer to each other than to compound eyes, postocellar distance .84 the ocello-ocular distance. Clypeus slightly convex, apical half with a number of irregularly spaced punctures, each giving rise to a long, apically directed, amber colored hair, apex trunctate. *Thorax:* posterior margin of pronotum broadly angulate; propodeum with a small depressed area on either side of the weakly impressed median longitudinal sulcus; wings nearly hyaline, forewing faintly infuscate through marginal and third submarginal cells, not infuscate at apex or over basal vein, microtrichiae not longer or more dense in infuscate areas than elsewhere, nervulus beyond basal vein by .15 its length, first recurrent vein meeting second cubital cell at its basal third, cubital vein meeting wing margin, second cubital cell nearly 1.4 the length of the third. *Abdomen:* first tergite with a few slender, erect hairs anteriorly.

Male. Unknown.

Holotype female, MILL VALLEY, MARIN COUNTY, CALIFORNIA, August 9, 1948 (Hugh B. Leech). The type is in the collection of the California Academy of Sciences.

A single specimen from Amortejada Bay, Isla San Jose, Gulf of California, Mexico, collected March 23, 1953 by P. H.

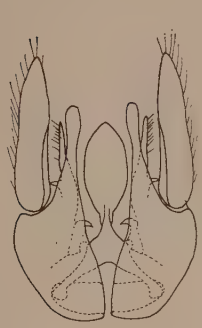
Arnaud (Sefton Orca Expedition) may be referable to *leechi*. It closely resembles the type but differs in the following details: appressed pubescence of face longer, more dense, forewings somewhat more strongly infuscate, posterior margin of pronotum more nearly arcuate, ivory bands on apices of trochanters lacking.

Dipogon leechi is probably most closely related to *D. brevis brevis* (Cresson) but differs primarily in the dull, strongly reticulate integument, long, rather sparse appressed hairs on the frons and vertex, by long, closely set, appressed hairs on the propodeum and first metasomal tergum and the scarcely infuscate forewing.

Dipogon (Dipogon) diablo Wasbauer, new species

Female.—Length 3.9 mm. Forewing 3.6 mm. Head, thoracic dorsum and abdomen dull, minutely granulo-reticulate, sides of thorax sub-shining; pubescence sparse over most of body, silvery with faint golden reflections on head, pronotum, and mesonotum, elsewhere silvery; appressed pubescence of head and pronotum no more dense than on remainder of body. Integumental color brown, the following areas suffused with blackish: head above antennae, fronto-clypeal line, first three and ultimate antennal segments, humeri, posterolateral margins of mesonotum, scutellum, postscutellum, metanotum, mesepisternum ventrally, coxae, femora and tibiae dorsally, and abdomen. *Head:* somewhat broader than long, facial distance .92 the transfacial; compound eyes noticeably convergent above, upper interocular distance .83 the lower interocular distance; ocellar triangle with the front angle slightly greater than a right angle; posterior ocelli nearer the compound eyes than to each other, postocellar distance 1.3 the ocello-ocular distance. Clypeus slightly convex, with a preapical row of larger punctures and a number of long, slender, apically directed hairs, apex subtruncate. *Thorax:* posterior margin of pronotum arcuate, but with a slight median notch; propodeum evenly convex posteriorly, without a median longitudinal sulcus; wings slightly infuscate over basal vein, a large diffuse, infuscate area apically, including marginal cell except apical third, apical half of first submarginal cell, first and second submarginal cells and third discoidal cell anteriorly; microtrichiae somewhat stronger in infuscate areas than between and basad of them; nervulus beyond basal vein by .6 its length; first recurrent vein meeting second cubital cell somewhat beyond its basal third, cubital vein reaching the wing margin, second cubital cell about 1.6 the length of the third. *Abdomen:* first tergite without erect hairs anteriorly.

Male.—Length 3.6 mm. Forewing 3.9 mm. Head and thoracic dorsum dull, minutely punctulate, the punctures contiguous, remainder of body subshining. Integumental color black, clypeus, antennae basally, mandibles apically, palpi, pronotum, forelegs and middle femora orange-colored, middle tibiae and tarsi and hind legs piceous. *Head:* lower face and clypeus with numerous long, decumbent, whitish hairs, vertex and occiput laterally and ventrally with a number of shorter, erect, proclinate hairs; ocellar triangle broad, the front angle greater than a right angle; lateral ocelli nearer to



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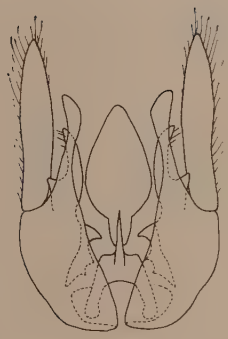

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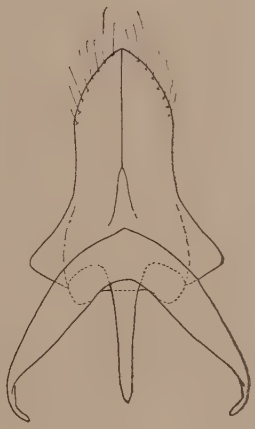

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Explanation of Figures

Figs. 1-3. *Dipogon* (*Dipogon*) *diablo* Wasbauer, allotype male. Fig. 1. Male genitalia, dorsal view. Fig. 2. Right paramere, exterior view. Fig. 3. Subgenital plate, ventral view (sternite VIII removed). Figs. 4–6. *Dipogon* (*Deuteragenia*) *calipterus nubifer* (Cresson), neallotype male. Fig. 4. Male genitalia, dorsal view. Fig. 5. Right paramere, exterior view. Fig. 6. Subgenital plate, ventral view.

compound eyes than to each other, postocellar distance 1.6 the ocello-ocular distance; front rather broad, middle interocular distance .63 transfacial distance; disc of clypeus evenly, not strongly convex, apex simple, subtruncate. *Thorax:* posterior margin of pronotum arcuate; scutellum convex, strongly raised above level of mesonotum; propodeum in profile with the slope nearly even from front to rear; forewing with a barely discernable infuscate spot over basal vein, a larger faint infuscation including proximal third of first submarginal cell, posterior half of marginal cell, second and third cubital cells, apical half of second discoidal cell, and a faint infuscation at apex of wing; nervulus beyond basal vein by .43 its length; hindwing with mediella between submediella and cubitella .93 the length of intercubitella. *Abdomen:* genitalia and subgenital plate as in figs. 1, 2, and 3.

Holotype female and allotype male, DANVILLE, CONTRA COSTA COUNTY, CALIFORNIA (F. X. Williams). Holotype August 12, 1949, allotype August 9, 1950. The types are in the collection of the California Academy of Sciences.

Dipogon diablo is the second known North American species belonging to the *graenicheri* group of Townes (U.S. Nat. Mus. Bull. 209, 1957, p. 138) and the female differs from *graenicheri* as follows: integumental color of abdomen entirely black, thorax variously suffused with blackish, thoracic dorsum and abdomen entirely dull, microtrichiae of forewing scarcely larger and denser in infuscate areas than elsewhere, infuscation diffuse, not well marked.

DIPOGON (DEUTERAGENIA) CALIPTERUS NUBIFER (Cresson)

Male.—Integumental color black, antennae ventrally, mandibles except at extreme base, palpi, posterolateral borders of pronotum, forelegs except coxa and trochanter, orange. Fore coxa suffused with orange posteriorly. Wings marked as in female. Genitalia and subgenital plate as in figs. 4, 5 and 6.

Neallotype male, El Toro, Orange County, California, September 1, 1959, ex. McPhail trap (C. Johnson) deposited at the California Academy of Sciences.

The male differs from *calipterus calipterus* (Say) in having orange markings on the pronotum. A male from El Cajon, San Diego County, California, August 10, 1959, collected by Klopfer (C.D.A.), differs from the neallotype only in having the orange pronotal markings more extensive.

Both males and females of this subspecies are attracted to baits and probably also to honeydew secretions. The majority of specimens before me have come from McPhail traps used in fruit fly detection.

Distribution—MEXICO. Vera Cruz: Orizaba, ♀, (Townes, 1957, U. S.

Nat. Mus. Bul. 209:125). California. Orange County: Garden Grove, ♀, (Townes, *ibid.*). El Toro, ♂, (Neallotype); same locality, ♀, X-13-1959, McPhail trap on orange tree (C. Johnson, C.D.A.). Atwood, ♀, X-1959, McPhail trap on orange tree (C. Johnson, C.D.A.). Modjeska, ♂, X-6-1959, McPhail trap on peach tree (C. Johnson, C.D.A.). Trabuco Canyon, ♂, X-27-1959, McPhail trap on orange tree (C. Johnson, C.D.A.). Yorba Linda, ♂, IX-18-1959, McPhail trap (C. Johnson, C.D.A.); same data, ♀, X-5-1959; same data, ♂, X-26-1959, McPhail trap on grapefruit tree. San Diego County: El Cajon, ♂, VII-10-1959, walnut twig (Klopfer, C.D.A.). Pala, ♂, X-1-1959, McPhail trap on sycamore (C. Johnson, C.D.A.). Rainbow Valley, ♂, X-16-1959, McPhail trap on orange tree (C. Johnson, C.D.A.); same data, X-23-1959. Sacramento County: Sacramento, ♀, IV-10-1959, on willow (G. Buxton, C.D.A.).

Aporus (Aporus) luxus (Banks)

In Bradley's excellent treatment of the subfamily Pompilinae (Trans. Amer. Ent. Soc., 70:23–157, 1944), *Aporus assimilis* (Banks) is considered a subspecies of *Aporus luxus* (Banks). The key provided for the separation of these subspecies involves the presence or absence of erect hairs on the front femora of the females. I have recently examined large series of *Aporus* in the collections of the California Academy of Sciences and the California Insect Survey and all females of *luxus (sensu lat.)* examined have a varying amount of erect hair on the femur. However, Bradley's subspecies concept appears to be valid and the material before me is about 75% separable on the basis of the following criteria:

Erect hair on front femur of female fine and very sparse, longer hairs on the outer side less than .25 the thickness of the femur in dorsal view; pubescence of antennal fossa silvery in certain lights..... ..... *luxus luxus* (Banks)

Erect hair on front femur of female stouter and more dense, longer hairs on outer side .25 to .40 the thickness of the femur in dorsal view; pubescence of antennal fossa not silvery, at most brownish to aurescent..... *luxus assimilis* (Banks)

I am unable to find constant differences in the males of the two subspecies and these must therefore be allocated by association.

Aporus luxus luxus (Banks)

This subspecies is characteristic of the Transition and Upper Sonoran life zones of southern California north to Marin County. The distribution is as follows:

California. Alameda County: Hills back of Oakland, ♀, X-3-1929 (E. C. Zimmerman, C.A.S.). Tesla, ♀, X-15-1948 (J. E. Gillaspy, C.I.S.). Contra Costa County: Mount Diablo, ♀, V-7-1939 (J. W. MacSwain,

C.I.S.). Orinda Cross Roads, ♀, IX-14-1953, flowers *Sambucus* sp. (M. Wasbauer, M.W.). Los Angeles County: Crystal Lake, 2 ♀♀, VI-29-1950 (P. D. Hurd, Jr., P. H. Timberlake, C.I.S.). Tanbark Flat, ♀, VII-13-1952 (J. W. MacSwain, C.I.S.). Marin County: Mill Valley, ♀, IX-1947 (E. S. Ross, C.A.S.). Monterey County: Carmel, ♀, X-5-1930 (L. S. Slevin, C.A.S.); same locality, ♀, VIII-25-1922, L. S. Slevin, C.A.S.); same locality, 2 ♀♀, X-2-1941 (L. S. Slevin, C.A.S.). Monterey, ♀, I-26-1930 (L. S. Slevin, C.A.S.); Pacific Grove, 2 ♀♀, X-29-1954 (M. Wasbauer, M.W.); same locality, ♀, X-13-1924, (L. S. Slevin, C.A.S.); same locality, ♀, IX-(14-16)-1920 (F. E. Blaisdell, C.A.S.). Paraiso Springs, ♀, XI-1-1930 (L. S. Slevin, C.A.S.). Plumas County: Meadow Valley, 4,000-7,000 ft., ♀, VI-8-1924 (E. C. Van Dyke, C.A.S.). Riverside County: Riverside, ♀, VI-10-1934 (A. J. Basinger, C.A.S.). Vandevanter Flat, San Jacinto Mts., ♀, VI-16-1940 (H. T. Reynolds, C.I.S.). Temecula, ♀, IV-11-1950 (P. D. Hurd, C.I.S.). Banning, ♀, VII-16-1950 (J. W. MacSwain, C.I.S.). San Bernardino County: Mill Creek Canyon, ♀, IX-24-1923 (E. P. Van Duzee, C.A.S.). San Diego County: Coronado Beach, ♀, 1890 (F. E. Blaisdell, C.A.S.). San Diego, ♀, X-24-1946 (W. W. Jones, C.A.S.). San Francisco County: San Francisco, 2 ♀♀, VII-(11-12)-1922 (F. X. Williams, C.A.S.); same locality, ♀, VI-28-1920 (F. X. Williams, C.A.S.); same locality, ♀, IX-1935 (E. S. Ross, C.A.S.); same locality, ♀, XI-12-1922 (C. L. Fox, C.A.S.); same locality, ♀, VI-1920, (F. X. Williams, C.A.S.). San Mateo County: Rockaway Beach, ♀, XI-12-1946 (W. E. Ferguson, C.I.S.). Nine mi. S. San Gregorio, ♀, XI-12-1946 (W. E. Ferguson, C.I.S.). Santa Clara County: Alum Rock Park, ♀, X-29-1951 (R. Williams, M.W.). San Antonio Valley, ♀, IX-14-1948 (P. D. Hurd, C.I.S.). Stevens Creek, ♀, V-28-1952 (D. Burdick, M.W.). Tuolumne County: Near Mather, ♀, VIII-13-1930 (E. C. Zimmerman, C.A.S.). Oakland Camp, ♀, X-2-1954 (M. Wasbauer, M.W.).

Lower California: 10 mi. N. San Ignacio IX-30-1941 (C.A.S.).

Aporus luxus assimilis (Banks)

This subspecies is found in the Upper Sonoran to Canadian life zones and is widespread in the Western States. The distribution is as follows:

British Columbia: Vernon, 2 ♀♀, VII-(4-7)-1947 (H. B. Leech, C.A.S.); same locality, ♀, VII-16-1947 (H. B. Leech, C.A.S.).

California. Alameda County: Berkeley, ♀, IV-21-1920 (E. C. Van Dyke, C.A.S.). El Dorado County: Pyramid Ranger Station, ♀, VIII-1-1949 (J. W. MacSwain, C.I.S.). Fresno County: Huntington Lake, 7,000 ft., ♀, VII-1927 (E. P. Van Duzee, C.A.S.). Mt. Kaiser, 9,000 ft., ♀, (F. C. Clark, C.A.S.). Humboldt County: Big Lagoon, 2 ♀♀, VII-11-1937 (E. P. Van Duzee, C.A.S.). Trinidad, 2 ♀♀, VI-6-1925 (J. O. Martin, C.A.S.). Inyo County: Antelope Springs, ♀, VII-11-1953, on *Chrysothamnus* sp. (J. W. MacSwain, C.I.S.). Big Pine Creek, 8,000-11,000 ft., ♀, VII-1-1929 (I. McCracken, C.A.S.). Lake County: Warner Lake, ♀, (C.A.S.). Lassen County: Hallelujah Jct., ♀, VII-12-54 (J. A. Powell, C.A.S.); same locality, ♀, VII-4-1949 (P. D. Hurd, C.I.S.). Near Butte Lake, Lassen Nat. Park, ♀, IX-13-1948 (C. D. MacNeill, C.I.S.). Marin County: Tomales Bay, ♀, VIII-14-1938 (E. C. Van Dyke, C.A.S.). Monterey County: Pacific Grove,

♀, X-29-1954 (M. Wasbauer, M.W.). Paraiso Springs, ♀, VII-15-1954 (O. and L. Bryant, C.A.S.). Nevada County: 7 miles E. Hobart Mills, ♀, VIII-26-1948 on *Chrysothamnus* sp. (J. W. MacSwain, C.I.S.). Placer County: Lake Forest, ♀, VII-14-1949 (E. G. Linsley, C.I.S.). Plumas County: 4 miles W. Quincy, ♀, VII-15-1949 (P. D. Hurd, C.I.S.). Meadow Valley, 4,000-5,000 ft., ♀, VII-2-1924 (E. C. Van Dyke, C.A.S.). San Bernardino County: Lake Arrowhead, ♀, VII-25-1932 (R. P. Allen, C.A.S.). San Francisco County: San Francisco, ♀, IV-28-1923 (F. X. Williams, C.A.S.); same locality, ♀, V-1925 (F. X. Williams, C.A.S.); same locality, ♀, VI-1920 (F. X. Williams, C.A.S.); same locality, ♀, VII-4-1922 (F. X. Williams, C.A.S.). Sierra County: Gold Lake, 2 ♀♀, VII-27-1921 and VIII-2-1921 (C. L. Fox, C.A.S.).

Idaho. Latah County: Moscow, ♀, VII-24-1925 (C. L. Fox, C.A.S.).

Oregon. Klamath County: Klamath Falls, ♀, VII-20-1922 (E. C. Van Dyke, C.A.S.). Clackamas County: Mt. Hood, near Gov't Camp, ♀, VIII-16-1939 (E. S. Ross, C.A.S.).

Utah. Cache County: Logan, ♀, VIII-12-1953 (E. S. Ross, C.A.S.).

Washington. Mt. Rainier National Park: Sunrise, ♀, VII-11-1934 (O. Bryant, C.A.S.). Pierce County: Ft. Lewis, 2 ♀♀, IX-14-1951 (R. O. Schuster, C.I.S.). Walla Walla County: Walla Walla, 2 ♀♀, VI-1936 (G. E. Bohart, C.I.S.). Whitman County: Pullman, ♀, VII-13-1925 (C. L. Fox, C.A.S.).

Localities where specimens intermediate between *luxus* and *assimilis* have been found are as follows: San Francisco, California, VII-11-1922 (F. X. Williams, C.A.S.); same data, VI-1920. Santa Cruz, California, VI-3-1919 (E. P. Van Duzee, C.A.S.). Near Gov't Camp, Mt. Hood, Oregon, VII-20-1937 (E. C. Van Dyke, C.A.S.). San Quintin, Lower California, V-9-1938 (W. E. Simonds, C.A.S.). Cabo San Lucas, Lower Califronia, III-16-1953 (P. H. Arnaud, C.A.S.).

Tastiotenia festiva Evans

Female, Rodeo, Hidalgo County, New Mexico, VIII-19-1958 (F. X. Williams, C.A.S.), on *Euphorbia*. This specimen differs from material collected at Borrego, San Diego County, California, the type locality, in the more deeply infuscated wingtips and the mesepisterna entirely black and the extensive black on the dorsal surface of the propodeum, extending to the basal portion of the mesocoxa. In addition, the middle and hind tibial spurs and all the tarsi are dark brown, nearly black.

Pompilus (Perissopompilus) phoenix Evans

Male, Mt. Diablo, Contra Costa County, California, VI-30-1952 (F. X. Williams, C.A.S.). This record is of interest since it represents the most northerly locality for *Pompilus phoenix*. The region is principally upper Sonoran in its faunal affinities, and may represent the northern periphery of the range of this species.

NEW SYNONYMY IN THE BUPRESTIDAE
(Coleoptera)

G. H. NELSON[1] AND W. F. BARR[2]

HIPPOMELAS, subgenus NANULARIA

Hippomelas Laporte and Gory, 1837, Hist. Nat. Icon. Ins. Coleop. Monog. Buprestidae, 1:92.
Nanularia Casey, 1909, Proc. Washington Acad. Sci., 11(2):172.
Ampheremus Fall, 1917, Ent. News, 28:68. *New synonymy*

A comparative study of the structure of a long series of the diminutive species *cylindricollis*, upon which the genus *Ampheremus* was based, has been made with examples of *Hippomelas (Nanularia) californica* (Horn), *H.(N.) brunneata* Knull and *H.(N.) cupreofusca* (Casey). This study has shown that the characters originally utilized by Fall in separating *Ampheremus* from *Nanularia, i.e.* cleft between the meso- and metasterna, structure of the maxillary palpi and the nature of the lateral margins of the pronotum are not of generic significance. Furthermore, no other structural features could be found that would justify the retention of *Ampheremus* as a distinct genus. Consequently, *Ampheremus* is here placed in synonymy with *Hippomelas* subgenus *Nanularia*.

HIPPOMELAS (NANULARIA) CYLINDRICOLLIS (Fall)

Ampheremus cylindricollis Fall, 1917, Ent. News, 28:69.
Hippomelas (Nanularia) inyoensis Van Dyke, 1942, Proc. California Acad. Sci., (4)24(3):112. *New synonymy*

The types of Fall's *cylindricollis* and Van Dyke's *inyoensis* have been studied by both writers. In spite of the fact that the former was collected at Palm Springs, California, and the latter approximately 200 miles north in an ecologically different area in the Owen's Valley, Inyo County, California, the two individuals are almost identical in structure, form and color. On the basis of this study *H. inyoensis* Van Dyke must be regarded as a synonym of *H. cylindricollis* (Fall).

[1]Department of Anatomy, College of Medical Evangelists, Loma Linda, California.
[2]University of Idaho, Moscow, Idaho.

AMBLYSEIUS SIMILOIDES, A NEW PREDACIOUS MITE FROM CALIFORNIA

(Acarina: Phytoseiidae)

T. C. BUCHELOS AND A. EARL PRITCHARD
University of California, Berkeley

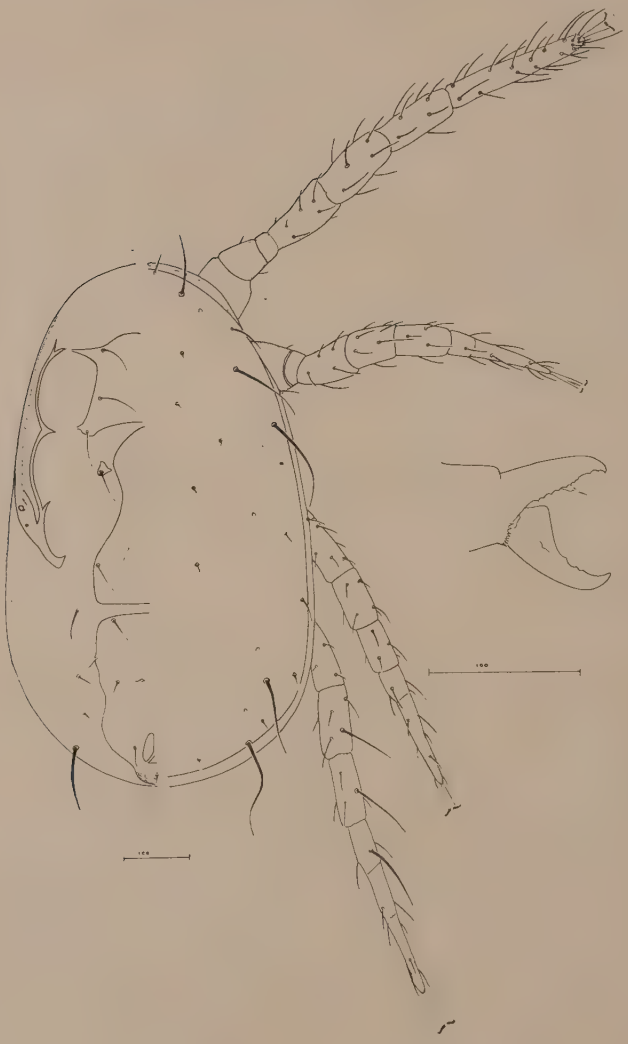
Amblyseius similis (Koch) is a name currently applied to a phytoseiid mite that is common in Europe. This name also has been applied to a similar mite that is common in California (Chant, 1960), but this species is certainly distinct from the description of *A. similis* given by Dosse (1958) from Germany. A name is needed in connection with the publication of biological studies of the California species, and it is here described.

Amblyseius similoides Buchelos and Pritchard, new species

Amblyseius similoides resembles *A. similis* in that the first and fourth lateral setae are long, with the second lateral seta shorter than the third; the fifth lateral seta is shorter than the sixth; and there are four pairs of dorsocentral setae in addition to the vertical setae. However, in *A. similoides* the spermatheca bears a very slender cervix in contrast to the broadly cup-shaped cervix of *A. similis*.

Female (Fig. 1).—Chelicera with chelae moderately developed, the movable digit with several fine teeth and the fixed digit multidentate. Dorsal shield smooth, with five pairs of pores; vertical setae moderately developed and second lateral similar in length, the third lateral longer, and the first and fourth laterals still longer: fifth, seventh, and eighth laterals very small, the sixth lateral definitely longer; ninth lateral very long, smooth; four pairs of dorsocentrals and anterior mediolaterals all very small; posterior mediolaterals long. Peritremes reaching vertical setae. Ventri-anal plate slender, the pre-anal portion longer than broad and similar in width to epigynial plate; three pairs of widely separated pre-anal setae and a pair of transverse pores between caudal pair; three pairs of para-anal setae; two pairs of slender metapodal platelets, the anterior pair much smaller. Sternal plate broader than long, the metasternal platelets separate. Spermatheca (Fig. 2) with cervix longer than broad at base, narrowing to the sharply bent atrium. Genu IV with a stout, pointed macroseta and six short setae; tibia IV with a stout, pointed macroseta and five short setae; basitarsus IV with a stout, pointed macroseta and three short setae. Lenth of idiosoma 432μ; greatest width of body 270μ.

Male (Fig. 3)—Spermatodactyl with shaft slender, the distal portion abruptly bent, bearing a slight protuberance at the bend, and tapering somewhat to a slightly widened apex. Dorsal shield with chaetotaxy similar to female. Ventri-anal plate with three pairs of widely separated setae and a



Explanation of Figures

Fig. 1, dorsal and ventral aspects of female of *Amblyseius similoides*, with enlargement of chelae.

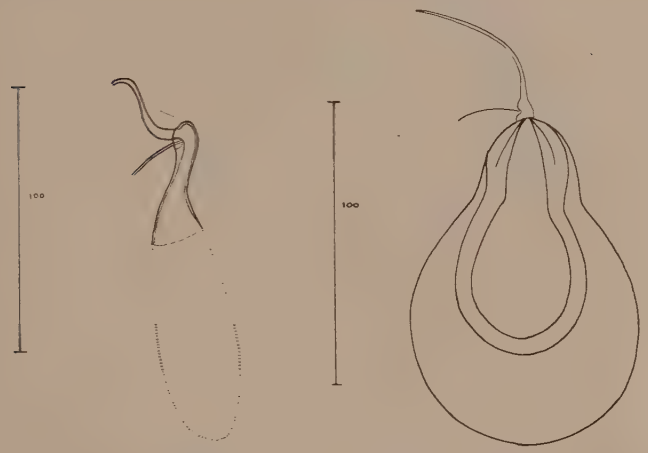


Fig. 2, left: spermatheca of *Amblyseius similoides;* right: spermatheca of *A. similis* (after Dosse).

Fig. 3, dorsal and ventral aspects of male of *Amblyseius similoides,* with enlargement of spermatodactyl.

pair of pores between and just posterior to caudomedian pair of setae. Length of idiosoma 302μ; greatest width of body 194μ.

Holotype female, REDWOOD CITY, SAN MATEO COUNTY, CALIFORNIA, September 2, 1957 (R. O. Schuster), on walnut: type No. 2728 in the U.S. National Museum.

Paratypes.—Forty-five females, 27 males, Redwood City, California, September 2, 1957 (R. O. Schuster), on walnut.

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BUTTERFLIES OF NORTH DAKOTA, by D. Lovell Puckering and Richard L. Post. North Dakota Agricultural College, Fargo, North Dakota. 56 pages (not numbered consecutively), text figs. Paper, $1.50. Published May 23, 1960.

This booklet treats the 91 species of Papilionoidea known for the area with a key and gives a short diagnosis, foodplant information, and distributional data for each. The work is primarily that of Mr. Puckering, a graduate student at North Dakota Agricultural College, and is based on activities of the North Dakota Insect Survey, supplemented by local private collections.

Although they include an annoying number of misspellings, the keys appear to be very useful, since they include black and white photographs of both upper and lower wing surfaces of each species figured on the same page with the couplet concerned. The authors were fortunate in securing the cooperation of a number of specialists, and they have used the numerical and nomenclatorial systems of the perennially delayed dos Passos Checklist. Therefore, the most recent name combinations are used, but evidently several new combinations are thus proposed in a taxonomic publication of limited distribution.

In general very little data are available about the distribution of insects in North Dakota, and this publication offers detailed information on the butterflies of the area, together with a short essay on the major physiographic elements affecting distributional patterns. Some interesting aspects of the transition or overlap zone between eastern and western entities in several species groups (*e.g.*, the *Papilio glaucus-rutulus* complex) are brought out. In addition, range extensions for a number of species are given.

The book will be of value to collectors in the northern midwest area, to students of butterfly systematics, and to persons interested in insect distribution in North Dakota and the relationship of the fauna of that area to other parts of North America.—JERRY A. POWELL, *University of California, Berkeley.*

DISTRIBUTION OF APHODIINAE IN OREGON

(Coleoptera: Scarabaeidae)

MANOHAR LAL JERATH
Oregon State College, Corvallis

The present report gives distribution records for the species of the subfamily Aphodiinae which have been found to occur in Oregon. Five species of Aegialiini, twenty-nine species of Aphodiini and three species of Psammodiini are included in this study. The species in each tribe are listed alphabetically and Leng catalog numbers, where available, are given after the author's name, in parentheses. Four species of *Aegialia* and twelve species of *Aphodius* are recorded from Oregon for the first time.

This work is based on a study of adults collected in Oregon and now in the collections of M. H. Hatch, University of Washington, Seattle, Washington; Joe Schuh, Klamath Falls, Oregon; L. G. Gentner, Medford, Oregon; Department of Entomology, Oregon State College, Corvallis, Oregon. Specimens which had not been determined by authorities in the group or which could not be determined with certainty by the writer were submitted to O. L. Cartwright of the U. S. National Museum for identification. Localities are listed alphabetically with the present location of specimens in various collections indicated by symbols as follows: H (M. H. Hatch), S (Joe Schuh) and G (L. G. Gentner). Unless designated, localities given in the following list refer to specimens in the Oregon State College collection.

TRIBE AEGIALIINI

Five species of the genus *Aegialia* have been found in Oregon. Four species, *Aegialia lacustris* LeConte, *A. latispina* LeConte, *A. conferta* Horn, *A. punctata* Brown and one subspecies, *A. crassa insularis* Brown are here reported for the first time. All the species of this tribe occurring in Oregon are represented in the Oregon State College collection.

AEGIALIA BLANCHARDI Horn (13100)

Common species in the Oregon coastal sand dune area throughout the year, Bandon, Cannon Beach, Ft. Clatsop, Dayton (also H), Kiger Island near Corvallis, Florence (also H), Gearhart, Sunset Beach, 6 m. N. of Gearhart, Hauser, Heceta Beach, Newport, Pacific City (also H), Oceanlake, Waldport (also S).

AEGIALIA CONFERTA Horn (13102 a)

Rare species. Kiger Island near Corvallis, Dayton, Forest Grove.

AEGIALIA CRASSA CRASSA LeConte (13105)

Rare species. Cannon Beach, Hauser (also H). Newport.

AEGIALIA CRASSA INSULARIS Brown (13105 a)

Rare species. Collected only at Neskowin.

AEGIALIA LACUSTRIS LeConte (13099)

This species, which is not very common, has only been collected in the sandy areas under the willows at Kiger Island near Corvallis and along a creek, 12 miles west of Adel.

AEGIALIA LATISPINA LeConte (13103)

Rare species. Kiger Island near Corvallis.

AEGIALIA PUNCTATA Brown (13102 b)

This species was collected in the sand dunes bordering Fossil Lake, during May 1957, where it was fairly abundant.

TRIBE APHODIINI

Twenty-nine species of the genus *Aphodius* have been taken in Oregon. The following 12 species are here recorded for the first time: *Aphodius alternatus* Horn, *A. consociatus* Horn, *A. denticulatus* Haldeman, *A. luxatus* Horn, *A. neotomae* Fall. *A. nevadensis* Horn, *A. phaeopterus* LeConte. *A. rectus biformis* Motschulsky, *A. sparsus* LeConte, *A. subaeneus* LeConte. *Aphodius* sp. 1 and *Aphodius* sp. 2.

APHODIUS ALEUTUS Eschscholtz (13122)

A very abundant species in deer droppings at high altitudes during summer. Crater Lake (H), Dayton (H). Hubbard (H). Mary's Peak near Corvallis (also H). Pamelia Lake, about 3,000 ft., Wallowa Lake (H).

APHODIUS ALTERNATUS Horn (13140)

Rare species. Cornelius, Corvallis, Forest Grove, Seaside. Steen Mts. above Fish Lake (H).

APHODIUS CASEYI Saylor

Listed from Oregon in the fifth supplement of Leng's catalog (Blackwelder and Blackwelder, 1948). The writer has never found this species in any of the material examined.

APHODIUS COLORADENSIS Horn (13179)

Occurs at high altitudes. Specimens in Hatch collection from Bone Springs and Tollgate Road (Blue Mts.).

APHODIUS CONGREGATUS Mannerheim (13121)

Leng (1920) lists the distribution from California to Alaska. The writer has not seen any specimens from Oregon.

APHODIUS CONSOCIATUS Horn (13138)

Bear Springs, Wasco Co. (H), Cornelius, Corvallis, Cabbage Hill east of Pendleton, Dreu Reservoir, Lake Co. (H), Forest Grove (H), Monzoita (H), Mottet Ranger Station (H), Seaside.

APHODIUS CRIBRATULUS Schmidt (13144)

Rare species, Corvallis, McMinnville (H), Peavine Ridge near McMinnville (H).

APHODIUS sp. near DECIPIENS Horn (13150)

Rare species. Meacham (H).

APHODIUS DENTICULATUS Haldeman (13112)

Fairly common species at high altitudes. Durkee (H), Forest Grove (H), Gold Center Camp, Blue Mts. (H), Medicine Hat (S), McMinnville (H), Suckers Creek Canyon (H), 30 m. south of Vale.

APHODIUS DILATICOLLIS Saylor

Rare species only known from Eugene and McMinnville. In Hatch collection.

APHODIUS DISTINCTUS (Mueller) (13184)

Common species in cow droppings. Ashland (also G), Baker (H), Cascadia, Cayuse, Corvallis (also H, S), Durkee, Freewater, Hood River, Klamath Falls (S), Kiger Island near Corvallis (S), McMinnville (also H), North Howell Prarier (S), Scappose, Talent (also G), Weston, Woodburn.

APHODIUS FIMETARIUS (Linnaeus) (13119)

A very abundant species in cow dung throughout Oregon. In a few localities specimens were collected from horse manure.

APHODIUS GRANARIUS (Linnaeus) (13131)

Adults of this species are fairly abundant in cow dung in Oregon. Larvae usually found in soil and may be feeding on roots of vegetation. Arlington (H), Blitzen Valley, Harney Co., Blooming, Bone Springs, Blue Mts. (H), Brogan, Cornelius, Corvallis, Dairy (H), Durkee (H), Eugene (also H), Forest Grove, Golden (H), Klamath Falls (G), McMinnville (H), Ochoco National Forest (H), Owyhee Canyon, Pendleton, Portland (S), Redmond, Salem, Talent (also G), Weston.

APHODIUS HAMATUS Say (13109)

Adults occur commonly at high altitudes in dung. Larvae

known to injure turf in pastures in Ruby Valley, Nevada. Oregon localities: Clackamas Lake (H), Devils Garden, Modoc National Forest, Gold Center Camp, Blue Mts. (H), 15 miles west of Klamath Falls, Lake Creek (H), Lakeview (H), Steen Mts., Swin (also S), Tollgate (H).

APHODIUS INUTILIS Horn (13187)

Leng (1920) lists this species from Oregon, but the writer has not seen any specimens.

APHODIUS LUXATUS Horn (13181)

Rare species. Forest Grove (H), McMinnville (H), Scio.

APHODIUS sp. near MILITARIS LeConte

Rare species, only known from McMinnville (H).

APHODIUS NEOTOMAE Fall (13125)

Rare species, occurring in wood rat nests. Three specimens collected at Corvallis.

APHODIUS NEVADENSIS Horn (13142)

Rare species, one specimen from Tumalo. From Hatch collection, now in U. S. National Museum.

APHODIUS OPACUS LeConte (13146)

Not very abundant, found usually in deer droppings at high altitudes. Bone Springs, Blue Mts. (H), Bald Mts. (H), Cornucopio (H), Gold Center Camp, Blue Mts. (H), Mary's Peak near Corvallis, McDonald Forest near Corvallis, Medford, Summit Prairie, Wallowa Lake (H), Yamhill Co. (H).

APHODIUS PARDALIS LeConte (13185)

Larvae of this species are injurious to golf turf (Ritcher & Morrison, 1955), fairly abundant when found. Albany, Corvallis (also S), Eugene, McMinnville (H), Scio (S).

APHODIUS PECTORALIS LeConte (13126)

Common species in deer droppings in wooded areas. Cannon Beach (H), Corvallis (H), Dayton (H), Gronite (H), eight miles north of Gold Beach on Rogue River, Mary's Peak near Corvallis, McDonald Forest near Corvallis, Peavine Ridge near McMinnville (H).

APHODIUS PHAEOPTERUS LeConte (13154)

Occurs at high altitudes. From Lewis Peak and Tollgate (Blue Mts.). In Hatch collection.

APHODIUS RECTUS BIFORMIS Reitter

Found in cow droppings. Willamette Valley localities Port-

land, McMinnville (H), Corvallis. Recently introduced, according to Hatch.

APHODIUS SPARSUS LeConte (13205)

A common species in wood rat nests, Corvallis, McMinnville (H).

APHODIUS SUBAENEUS LeConte (13139)

This species occurs at high altitudes. Known from Steen Mts. above Fish Lake (H).

APHODIUS VITTATUS Say (13132)

A very abundant species in cow dung all over the state.

APHODIUS species 1.

One specimen collected on snow at Mary's Peak near Corvallis by Frank Hasbrouck during June, 1955. Specimen now in U. S. N. M. (According to Cartwright, in a personal communication, it is a new species.)

APHODIUS species 2.

One specimen collected in deer droppings at Mary's Peak near Corvallis by Ritcher and Jerath on August 9, 1955, and now at U. S. N. M. (According to Cartwright, in a personal communication, it is a new species.)

TRIBE PSAMMODIINI

Two species of the genus *Psammodius* and one species of *Pleurophorus* are recorded in the literature as occurring in Oregon.

PSAMMODIUS OREGONENSIS Cartwright

A very common species in the Oregon coastal sand dunes, found in large numbers.

PSAMMODIUS CAELATUS (LeConte) (13245)

Not a very common species. Bandon (also U. S. N. M., p. 447), Hauser, Newport, Taft (U. S. N. M.) and Woods (S).

PLEUROPHORUS CAESUS (Creutzer) (13255)

Not usually common but Hinman and Larson (1935: p. 149) collected 131 specimens in flight traps during 1931 and 1932 in the Willamette Valley: Bakers Creeks (H), Forest Grove (H. S), Grants Pass (H), McMinnville (H), Portland (S), St. Helens (S).

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ZOOLOGICAL NOMENCLATURE: NOTICE OF PROPOSED USE OF PLENARY POWERS IN CERTAIN CASES (A.[N.S.]45)

In accordance with a decision of the 13th International Congress of Zoology, 1948, public notice is hereby given of the possible use by the International Commission on Zoological Nomenclature of its plenary powers in connection with the following cases, full details of which will be found in Bulletin of Zoological Nomenclature, Vol. 17, Parts 9/11 to be published on 16 September 1960.

(3) Validation of the generic name of *Macronema* Pictet, 1836 (Insecta, Trichoptera) Z.N.(S.)706

(7) Suppression of the family name NIRMIDES [Leach, 1815] (Insecta, Mallophaga) Z.N.(S.)1400

(8) Designation of a neotype for the nominal species *Pediculus dentatus* Scopoli, 1763 (Insecta, Mallophaga) Z.N. (S.)1394

(10) Suppression of the generic name *Liotheum* Nitzsch, 1818 (Insecta, Mallophaga) Z.N.(S.)1399

(11) Suppression of the specific name *pellarini (Aedipoda)* Le Guillou, 1841 (Insecta, Orthoptera) Z.N.(S.)1436

Any zoologist who wishes to comment on any of the above cases should do so in writing, and in duplicate, as soon as possible, and in any case before 16 December 1960. Each comment should bear the reference number of the case in question. Comment received early enough will be published in the *Bulletin of Zoological Nomenclature*. Those received too late for publication will, if received before 16 December 1960, be brought to the attention of the Commission at the time of commencement of voting.

All communications should be addressed to: Secretary, International Commission on Zoological Nomenclature, c/o British Museum (Natural History), Cromwell Road, London, S.W. 7, England.—W. E. CHINA, *Assistant Secretary, International Commission on Zoological Nomenclature.*

OBSERVATIONS ON THE BIOLOGY OF CHILOXANTHUS STELLATUS (CURTIS) AND C. ARCTICUS (SAHLBERG)

(Hemiptera: Saldidae)

ROBERT L. USINGER

University of California, Berkeley

The genus *Chiloxanthus* is Holarctic in distribution. *C. stellatus* is recorded in the Drake and Hoberlandt catalogue (1950) from Northern Europe, Siberia, Alaska, and Canada. *C. arcticus* is listed in the catalogue as a synonym of *pilosus* (Fallen) from Europe, Siberia, and North Africa. According to Linnavuori (1953), "*Ch. arcticus* is, however, a good species . . . *Ch. arcticus* is best distinguished from *Ch. pilosus* by the light, short, smooth hair-covering of the upper surface, while *Ch. pilosus* always has a long, dense, black and upstanding hair-covering . . . Also the living habits and the distribution are dissimilar. *Ch. pilosus* is halobiontic, being common on salty seashores of North and Central Europe, and known also from the salty biotopes near Halle in Germany . . . *Ch. arcticus*, being a high boreal insect, occurs only on the shores of the Arctic Sea both in Europe and Siberia. It is not confined to salty water, but may extend far into the tundra, too."

In the summer of 1955 an opportunity was presented to study Saldidae at various places along the Arctic Coastal Plain while primarily engaged in other studies with headquarters at the Arctic Research Laboratory at Point Barrow, Alaska. Thanks are due to the authorities of the Arctic Institute of North America and the Office of Naval Research for support of this work.

CHILOXANTHUS STELLATUS (Curtis)

This species was found only in the vicinity of Point Barrow but must be widespread in the tundra at high altitudes, (Weber, 1950). It occurs only on the well drained parts of high polygons and was never found, with diligent searching, in such saldid habitats as mud flats, low areas in the sphagnum, or along the ocean beaches or lake shores. On July 18 and 26 nymphs and adults were common; nymphs were in the first and second instars. At the same locality P. D. Hurd collected adults from June 30 to August 7 in 1952 and 1953 and last instar nymphs from June 17 to July 21, 1953.

Britton (1958) describes the tundra landscape including "high" and "low" polygons and "ditch-like troughs" between as

follows: "All substrate materials, with the possible exception of those underlying the deeper lakes, are perennially frozen to depths of several hundred feet below a surface zone that thaws each warm season. This zone, called the active layer, develops most rapidly, extending to depths of several feet, in well-drained sands and gravels. The poorly drained ditchlike troughs which conspicuously pattern the ground thaw very slowly, to depths of only a few inches each season."

It is evident that *Chiloxanthus stellatus* occupies the "active layer" described above and that it thus avoids the chilling effects of the permafrost for perhaps eight weeks each year. The length of nymphal instars is not known but the species is large and the season is short. With nymphs of all stages occurring during the summer and adults and last instar nymphs found "early" in the summer, it seems certain that adults and nymphs overwinter in a semi-frozen state, protected only by the thin layer of a few inches of tundra vegetation.

CHILOXANTHUS ARCTICUS (Sahlberg)

I am indebted to Linnavuori for comparing my Alaskan material with specimens from Finland and Siberia. *C. arcticus* was collected only on mud flats along the shores of the Kuk River inland from Wainwright. The distance from Pt. Barrow is about 100 miles in a southwest direction. The saldids were found July 30, 1955 on the hard packed open mud flats where the fresh water of the Omalik River empties into the broad Kuk Inlet. Collecting was difficult because there was a strong wind and the bugs found shelter in mud cracks. There were many more nymphs than adults, and the nymphs were in stages two to five. *C. arcticus* was never found on salt water beaches or inland on the tundra.

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FIRST NORTH AMERICAN HOST RECORD OF THE ADVENTIVE WASP, CHRYSIS FUSCIPENNIS BRULLE

(Hymenoptera: Chrysididae)

GERALD I. STAGE

University of California, Berkeley

While making investigations on the parasites and associates of *Osmia clarescens* Cockerell (Megachilidae: Apoidea) utilizing empty mud nests of *Sceliphron caementarium* (Drury), a number of cells containing larvae of a chrysidid wasp were discovered. The adults which emerged in the laboratory were subsequently identified with the kind assistance of Karl V. Krombein as *Chrysis (Chrysis) fuscipennis* Brullé. This adventive wasp was first recorded in North America by Krombein (1956) when three females and one male were collected in Washington, D.C. Its Old World distribution encompasses the regions of Indo-Malaya, Syria, Palestine, Egypt, Asia Minor, China and Australia (Bingham, 1903, p. 468). The only other record from this continent concerns a single female taken in a house at Galt, Sacramento County, California (Harper, 1959).

The *Sceliphron* nests which contained the chrysidids were collected January 31, 1959, from under the roof, eaves, and along the upper walls in several old buildings at a ranch two miles northwest of Turlock, Stanislaus County, California. It was then noted that perhaps a dozen of the closed mud cells had a single conical puncture (about 1.5–2 mm. in diameter at the surface, narrowing to about .5 mm. internally) near the middle of the exposed side. Internal examination of the cells in the laboratory showed a one hundred per cent correlation between the presence of the chrysidid parasitoid and the punctures on the outside of the cells. A brown plug could be seen sealing the constricted inner third of the puncture and extending internally over the cell wall to form a thin circular convex flange about two millimeters in diameter. It appears to be formed from a dried liquid (probably of secretory origin) placed there upon withdrawal of the chrysidid's long ovipositor.

The relationship between *Sceliphron* and *Chalybion californicum* (Saussure) has long been known, and the cells taken over by *Chalybion* can in all cases be recognized on close examination (Rau, 1928, pp. 443–444). In the parasitized cells the original mud cap was apparently undisturbed, which would not

be the case if the cells had been previously appropriated by *Chalybion*. In a high percentage of cases, however, the unparasitized cells from the same locality yielded *Chalybion*, but this does not necessarily indicate that this wasp is not parasitized by the chrysidid.

In the parasitized cells the only host remains were the specialized meconial portion (*i.e.*, the chuck and chuck chamber of Shafer, 1949, pp. 30–31), and the anterior portion of the cocoon. Using the criteria set forth by Rau (1915), it was determined that all the identifiable cocoons were those of *Sceliphron*, thereby confirming the conclusion formed on the basis of the condition of the cell caps.

When first examined, the chrysidid larvae were mature and had already constructed cocoons. These pale yellow, parchment-like, semi-transparent cocoons were constructed of fine silk, and conformed closely to the lower third or fourth of the mud cells. In two instances the sphecid chuck chambers were in their normal position in the lower end of the cell with the chrysidid cocoon formed closely in contact above. In the remaining examples, the chuck chamber had been moved from its normal position and was variously placed near the center of the cell with the chrysidid cocoon then constructed below it. The creamy white meconium of the chrysidid was placed on the exposed top of the cocoon. It was extremely variable in shape, ranging from botuliform to globular. The nearly intact top half of the sphecid cocoon filled the top of the cell.

The cocoons were kept in the laboratory at room temperature, and the chrysidids (nine males and one female) emerged between April 6 and May 5, 1959. The sphecids, kept under the same conditions, all emerged between April 5 and April 23, 1959. All but two of the cells containing chrysidids were opened for observation in January. The parasitoids from these remaining two emerged through holes chewed through the mud caps at the top of the cells. All the chrysidid larvae, except those removed for preservation, successfully completed their development.

It seems apparent from these observations that *Chrysis fusci-pennis* Brullé is a parasitoid on *Sceliphron caementarium* (Drury), attacking the mature larvae overwintering within their cocoons. Oviposition is accomplished by making punctures in the mud walls of the sphecid cells, which are then sealed upon withdrawal

Explanation of Figure

Nests of *Sceliphron caementarium* (Drury) parasitized by *Chrysis fuscipennis* Brullé. A. *Chrysis* cocoon. B. *Chrysis* meconium. C. *Sceliphron* chuck chamber. D. Remains of *Sceliphron* cocoon. E. Oviposition punctures of chrysidid (x-section). F. Oviposition punctures of chrysidid (external view). G. *Chrysis* emergence holes.

of the ovipositor. The chrysidid overwinters as a larva and emerges in the spring by chewing through the mud cap on the cell.

One of the previous Old World host records for *Chrysis fuscipennis* concerns a vespid, *Eumenes conica* (Fabricius), in India (Bingham, 1899). In this case the chrysidid gained access to the cell through the unsealed entrance in a brief absence of the provisioning vespid. Bingham's later examination of the nest showed two different semi-transparent eggs, the larger stuck on the cell wall while the other was on the single provisioned caterpillar. Bingham (1903, p. 468) also cites *Eumenes petiolata* Fabricius and *E. flavopicta* Blanch as hosts of this parasitoid in India.

It may be of interest to note that at this same Turlock ranch a determined effort was made to collect every *Sceliphron* nest that could be located in September of 1956. No evidence of *C. fuscipennis* was apparent at that time upon careful examination of all the approximately one hundred and fifty cells obtained. Also the author and Roy R. Snelling had collected Aculeate Hymenoptera intensively in the general Turlock area during the preceeding five years (occasionally examining *Sceliphron* nests) without ever turning up this species of parasitoid. This may indicate that the advent of the chrysidid into the Turlock area occurred after 1956.

The author wishes to express his appreciation for the helpful criticism and generous assistance of C. Don MacNeill, California Academy of Sciences, and Jerry A. Powell, University of California, Berkeley, in the preparation of this article.

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TWO NEW SPECIES OF CATOCHINE GALL MIDGES, WITH A NEW KEY TO GENERA OF THE CATOCHINI

(Diptera: Cecidomyiidae)

A. EARL PRITCHARD
University of California, Berkeley

Gall midges belonging to the tribe Catochini are considered rare. Many of the known adults have been taken only in cold weather off snow. It is of considerable interest to learn that two species occur in the western United States, and both of these are described as new.

A female of *Anocha spinosa* (Felt), collected at Itasca Park, Minnesota, January 7, 1954, flying at -20° F. over snow, was forwarded to me by Dr. C. E. Mickel. A study of this and two other specimens recorded from Minnesota showed that the wing membrane possesses macrotrichia. Therefore, my key to genera of the tribe Catochini (1947) was erroneous, and a new key is presented. The genus *Catarete* Edwards is not included in this key because the antennal sensoria have not been described. The wing of *Catarete* is distinctive in that vein R_5 is very close to the costa and terminates before the apex of the wing.

KEY TO THE GENERA OF CATOCHINI

1. R_1 reaching costa before end of wing; flagellum without forked sensoria 2
– R_1 reaching costa at apex of wing; flagellum with forked sensoria 4
2. Flagellar segments each with a pair of budlike sensoria 3
– Flagellar segments with only sensory setae and rods ..... *Anocha* Pritchard
3. Medial fork with branches even; costa extending nearly to M_1 ..... *Neocatocha* Edwards
– Medial fork with branches very uneven, the upper branch sigmoid; costa ending just beyond R_5 ..... *Tritozyga* Loew
4. Wing membrane without macrotrichia or nearly so ..... *Eucatocha* Edwards
– Wing membrane with fairly dense macrotrichia ..... *Catocha* Haliday

Eucatocha betsyae Pritchard, new species

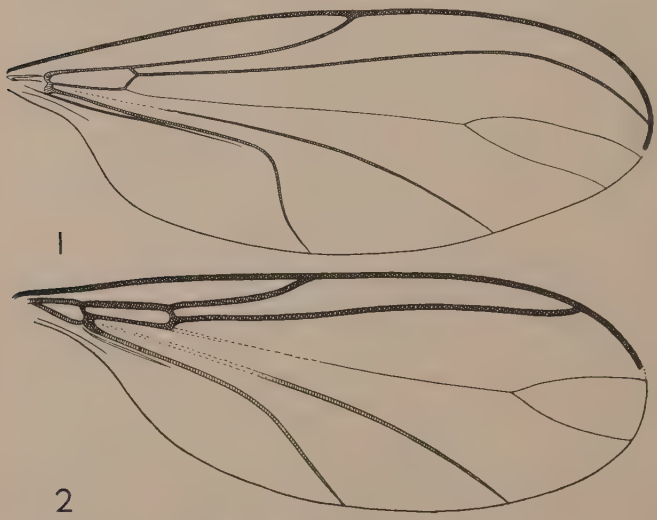
(Figure 1)

Eucatocha betsyae differs from *E. barberi* (Felt), the only

other species in the genus, in that the cubitus is sharply bent and sigmoid. The female of *Eucatocha* is here described for the first time.

Female.—Eyes with dorsolateral bridge about four facets wide. Antenna with 2+9 segments; first flagellar segment very long, the ninth very small, the other flagellar segments each with a distal neck, about three-fourths as long as the enlargement and the enlargement beyond the whorl of tactile setae set with long sensory setae and four sensoria each bearing 4 to 7 long, tapering branches. Palpus with four segments, the first with blunt sensory setae on inside. Wing (fig. 1) membrane with only a few macrotrichia at tip; R_5 strongly curved distally and reaching tip of wing; medial fork plain, moderately long; Cu sharply bent and sigmoid. Claw with 4 or 5 short medio-lateral teeth; empodium short, with three pairs of hairs. Ovipositor with lamellae articulated to tenth tergite; spermathecae two, rather large, rounded. Length of wing, 5.3 mm.

Holotype female, STRAWBERRY, TUOLUMNE COUNTY, CALIFORNIA, December 27-31, 1958 (Betsy Schneider and Earl Pritchard); in the Pritchard collection at the University of California, Berkeley. Paratypes: Four females, same data as holotype; one female, Sagehen Creek (11 miles north of Truckee), Nevada Co., California, December 4, 1954 (E. M. Brock).



EXPLANATION OF FIGURE

Fig. 1. Wing of *Eucatocha betsyae.*

Fig. 2. Wing of *Anocha celesteana.*

This species is named in honor of Mrs. Betsy Schneider. The specimens were found flying in the afternoon, over snow, at temperatures around freezing.

Anocha celesteana Pritchard, new species

(Figure 2)

Anocha celesteana differs from *A. spinosa* (Felt), the only other species in the genus, in that the eye bridge is devoid of facets laterally and the cubitus is simply and evenly curved.

Female.—Eye with lateral bridge widely devoid of facets. Antenna with 2+8 segments; flagellar segments elliptical with very short distal necks, each with the distal sensory setae blunt. Palpus with four segments. Wing (fig. 2) with C extending to break just before M_3; R_1 not reaching middle of wing; R_5 slightly sigmoid, widely separated from costal margin and reaching it well before end of wing; M_{1+2} weak and its branches short and weak; M_{3+4} strong but free; Cu evenly rounded. Claws slightly curved, with very small mediolateral teeth; empodium rudimentary. Spermathecae deeply pigmented. Length of wing, 2 mm.

Holotype female, Cheyenne, Wyoming, September 24, 1947 (D. G. Denning); in the Pritchard collection at the University of California, Berkeley.

This species is named in honor of Mrs. Celeste Green.

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PARATRIATOMA FROM THE MAINLAND OF MEXICO

(Hemiptera: Reduviidae)

Raymond E. Ryckman and Lee E. Olsen[1]

College of Medical Evangelists, Loma Linda, California

The monotypic genus *Paratriatoma* consists of the nominate species, *hirsuta* Barber (1938). This species was described from the Grand Canyon of the Colorado River. Subsequent to 1938 this kissing-bug has been reported in the Colorado and Mojave Deserts of California, southern Nevada and central Arizona by Wood (1941), Usinger (1944) and Ryckman (1953). On ecological grounds this species should be expected to occur in the desert regions of northern Sonora.

[1] This investigation was supported in part by a grant (E-173) from the National Institutes of Health, U.S. Public Health Service.

On April 11, 1960, the authors, assisted by A. E. Ryckman and J. V. Ryckman, examined several *Neotoma* lodges on Highway No. 2, 81 miles west of Sonoyta, Sonora, Mexico. Two of the lodges studied contained *Paratriatoma hirsuta*. Nest No. 1 contained five, fifth instar nymphs; and from nest No. 2 the following were collected: nine, fifth instar nymphs and twenty-one adults. The two nests combined contained seventeen adult males; four adult females; ten male and four female fifth instar nymphs. In addition to the above bugs, four adult males and one fifth instar female nymph of *Triatoma rubida* (Uhler) were collected from nest No. 2. It would appear that the spring emergence from fifth instars to adults was well underway on April 11 when these collections were made.

The nests of *Neotoma* in this area were usually found to be associated with mesquite and ironwood trees. These wood-rats inhabited relatively extensive underground burrows beneath their stick lodges. The *Paratriatoma hirsuta* nymphs collected from nest No. 1 were one and one-half feet below the surface of the ground and approximately three feet from the entrance to the underground burrow. The nymphs were in a mass of cactus spines in the burrow.

This is a southern extension of the known range of *Paratriatoma hirsuta* by approximately 150 miles and the first report of this genus on the mainland of Mexico.

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RHIZOMARIA PICEAE HARTIG NEW TO AMERICA

(Homoptera: Aphidae)

F. C. HOTTES

Grand Junction, Colorado

Because the species discussed herewith has been placed in almost as many genera as times it has been mentioned in aphid literature the generic name first used with it is retained in this brief note.

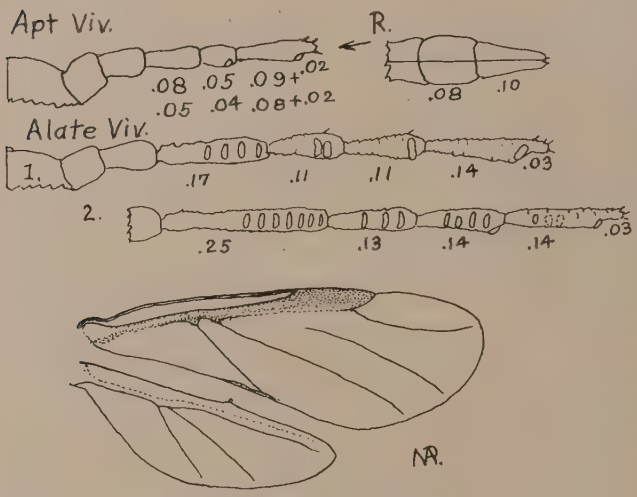
In 1953 while weeding under a blue spruce tree, my hoe brought up a small rootlet surrounded by a mass of flocculent matter. I could not associate this material with aphids although I suspected them, nor could I identify the root, or locate more flocculent matter. In June of 1959 I bought several small trees of *Picea pungens* from a local nursery, they in turn having purchased them from a nursery in Delta, Colorado where the plants had been grown from seed. The trees were in gallon cans. Upon removing the trees from the cans I at once noted the same flocculent matter I had seen in 1953 and was able to associate it with aphids. From this material I have been able to rear many apterous viviparous females and two alate specimens. The two alate specimens differ from each other and may not belong to the same species.

I could not associate the specimens with species known to me, or identify them from descriptions in the literature. Material was sent D. Hille Ris Lambers who determined it as the species described by Hartig in 1857 as *Rhizomaria piceae*. A search of the literature was then made. Baker (1920) placed *Rhizomaria* as a synonym of *Pemphigus* Hartig. Only one reference to *piceae* under this genus was found, and this species does not appear to belong to this genus because of the rather large wax glands on the thorax of the alata and the apparent absence of cornicles in this form. Use of Baker's keys fails to place this species in *Pemphigus* but more nearly in the genus *Prociphilus* Koch.

I strongly suspect that we need further information concerning this species before we can correctly place it generically and for this reason treat it in the genus proposed for it by Hartig.

The genus *Rhizomaria* was proposed by Hartig in 1857, not 1856 as reported by Börner (1952), for the species *piceae* described at the same time. Hartig's description of the genus is very brief, and is based upon the structure of the sensoria. His description of *piceae* is not good, and is in error in his reference

to "two staff-shaped honey tubes" on the males which he did not have. Tullgren (1909) placed *piceae* in the genus *Pemphigus* and cited a paper I have not seen by Jacobi (1905) who placed it in *Rhizomaria*. Theobald (1929) provisionally placed *piceae* in the genus *Pachypappella* Baker. Börner (1932) placed *piceae* in the genus *Pachypappa* Koch and looked upon it as a synonym of *Pachypappa vesicallis* Koch. Börner (1952) and Börner and Heinze (1957) did likewise. Baker (1920) placed *Pachypappa* as a synonym of *Pemphigus*.



EXPLANATION OF FIGURES

Rhizomaria piceae Hartig: apterous viviparous female, antenna and rostrum; viviparous female, antenna forms, wings.

The apterous forms of this species are extremely small and pale in color except for two dusky areas on the head separated by a clear median line. Cornicles have not been noted. Apterous specimens produce an abundance of flocculent material far in excess of that which would be expected from their numbers. This material arises from the posterior region of the dorsum of the abdomen and takes the form of flat ribbon-like material which extends some distance beyond the abdomen. It is white and at times bluish. Specimens taken in December had a distinctly

different secretion from those taken in the summer. The secretion was not at all flocculent, nor ribbon-like but rather thread-like and surrounded the specimens much like a cocoon.

It was decided not to plant the trees but rather to use them for rearing additional specimens. Several methods were tried for rearing, which permitted frequent observation with a minimum amount of disturbance to the roots. It was found that the aphids

EXPLANATION OF FIGURE

Rhizomaria piceae Hartig: flocculent material on roots of *Picea pungens.*

did not tolerate a soil which retained water. Therefore adequate drainage had to be provided and care used in the application of water. The method of rearing which gave best results was as follows. The trees were removed from the cans and the sides of the root mass covered with a band of aluminum foil. The bottom of the soil mass was left uncovered. The tree was then planted in peat moss in a large clay pot. To observe the aphids one had only to remove the tree from the pot and unwind the aluminum band.

Aphids on trees planted directly in peat moss did not follow the roots into the moss, the moss first having to be removed, a process which took time, when the aphids were observed.

The paper in which Hartig published his descriptions appears to be extremely difficult to locate. It is interesting to note that this paper is not listed in Index Litteraturae Entomologicae by Horn and Schenkling. Perhaps this is due to the fact that Hartig's paper is without a title and in the form of a letter which begins "My esteemed Friend," and ends "Your devoted friend, Theodor Hartig."

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NOTES ON THE OCCURRENCE OF FOUR ADVENTIVE EARWIGS IN ARIZONA

(Dermaptera)[1]

W. L. Nutting

University of Arizona, Tucson

Schlinger *et al.* (1959) have recently reported on the firm establishment of the predaceous earwig, *Labidura riparia* (Pallas), in agricultural desert valleys of southern California. Since this insect had previously been known from Florida irregularly westward only into Texas, it seems pertinent to document its occur-

[1] Arizona Agricultural Experiment Station Technical Paper No. 539.

rence in Arizona. The records are taken from 26 specimens which have been routinely deposited in the collection of this department by several different entomologists. No attempt has been made to work out details of the biology or distribution of this earwig in Arizona.

The distribution is, as might be expected, near the centers of major irrigated farming areas in the south: Yuma, April to November, 1952, 1954 to 1957; Phoenix, March 1958; Chandler, September 1959; Casa Grande, April 1958; Tucson, April 1955, 1958, September 1959. The first Arizona specimen was taken at Yuma on July 24, 1952, by D. M. Tuttle, Entomologist at the University of Arizona Agricultural Experiment Station, Yuma. It is interesting to note, and perhaps not merely coincidental, that this record is but 55 miles farther east and four months earlier than the first published Californian collection. As in California also, no further records are available until 1954. In spite of the rather intensive and continuing survey which is carried on in the agricultural areas of southern Arizona, it is surprising that almost no specimens of this conspicuous insect were taken to the eastward until 1958. Although the evidence is purely circumstantial, it does point to Calexico and Yuma as possible foci of introduction with subsequent spread through commerce northward and eastward. Isolated collections from Puerto Peñasco and Guaymas, Sonora, Mexico, in 1959 may be worth noting, but will probably generate little more than speculation concerning their relation to the California and Arizona populations of this insect.

Gurney (1950) and Schlinger *et al. (op. cit.)* have mentioned the African earwig *Euborellia cincticollis* (Gerst.) as another relatively recent (1946) adventive in California along the lower Colorado River. From the Arizona records in our collection, a rather similar case might be made for this insect as well. It was first taken at Yuma, on September 24, 1949, and again in 1950 and 1955. Subsequent collections are as follows: Florence, 1951, 1955; Mesa, 1952, 1955, 1956; Hassayampa and Arlington, 1955; Tucson, 1958; and Chandler, 1959. Hubbell and Wallace (1955) have also reported on collections of *E. cincticollis* from Tempe in 1951 and 1952. Although no detailed observations have been made on this earwig, some of the specimens were swept from alfalfa by G. D. Butler of the Department of Entomology, and others were taken in houses, motels and at lights.

Hubbell and Wallace *(op. cit.)* further mentioned collections of the closely related, but apterous, *Euborellia annulipes* (Lucas) from Tempe and Scottsdale in 1951. The following records of this Tropicopolitan earwig from our collection show that it had become rather widely established here much earlier: Tucson, 1922; Buckeye, 1932; Yuma and Mesa, 1939; Nogales, 1947; and Sells, 1954. It is now extremely common in residential and irrigated areas in the warmer parts of the state. Indeed, Hebard cited records from Texas as early as 1904 (1917); Sinaloa, 1916 (1922); and Baja California, Mexico, 1921 (1923); California, 1885 (1917) and from Phoenix, Arizona, during or before 1917 —no date given (1917).

The European earwig, *Forficula auricularia* (Linnaeus), has long been known from many cities on both the Atlantic and Pacific coasts, but has apparently not hitherto been recorded from Arizona. Although it may have reached Arizona much earlier, our collection contains only three adult specimens taken at Phoenix in March, 1958. The seeming lack of records and the very recent notice of this conspicuous and troublesome earwig certainly do not attest to a firm establishment here as yet. However, these specimens perhaps presage the spread of yet another adventive earwig, at least in the irrigated areas of the state.

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A SYSTEMATIC STUDY OF NORTH AMERICAN PRIONONYX

(Hymenoptera: Sphecidae)

F. D. PARKER

University of California, Davis

Since the general work of Fernald (1907) on Sphecini, the only systematic paper dealing with North American *Prononyx* was that of R. M. Bohart (1958). The latter described one new species and presented a key to the genus in which the females of *P. thomae* (Fabricius) and *pubidorsum* (Costa) were separated for the first time. A further study under Bohart's direction has revealed additional characters of value and has made it necessary to remove one species from synonymy.

The conformation of the clypeus was used by Bohart to separate the females of *thomae* and *pubidorsum*. Although this is a valid method, it was found that the palpi offered much better characters. In *thomae* the maxillary palpus is more than twice as long as the labial palpus, whereas in *pubidorsum* the two palpi are about equal in length (figs. 7, 8).

Closer examination of *pubidorsum* specimens from many parts of North America revealed the presence of two specific entities. One of these, *canadensis* Provancher (1889), was placed in synonymy by Fernald (1907). *P. canadensis* differs in the male by having narrow fossulae on antennal segments V-VII instead of on segments V-VIII as shown in figs. 1 and 2. The females can be distinguished by the silvery pubescence of the prothoracic lobes, which is marginal in *canadensis* and covers more than one-half of the lobe in *pubidorsum*. The known range of *canadensis* is northern California, Idaho, Nevada, Oregon, Utah, and Washington. *P. pubidorsum* is a more southern species, occuring in Arizona, California, Nevada, New Mexico, Texas, and south through Mexico into South America. There is some overlapping of the two species in California and Nevada.

Antennae of male *Prononyx* have good taxonomic charecters, which are illustrated in figs. 1–6. The shallow depressions or fossulae occur on segments V-VIII except in *canadensis* which has none on VIII, and in *ferruginea* (Fox) which has none. They are narrow in *canadensis*, *pubidorsum*, and *subatrata* Bohart, but broad in *atrata* (Lepeletier), *thomae* and *fervens* (Linnaeus). In *subatrata* the fossula on segment VIII is abbreviated.

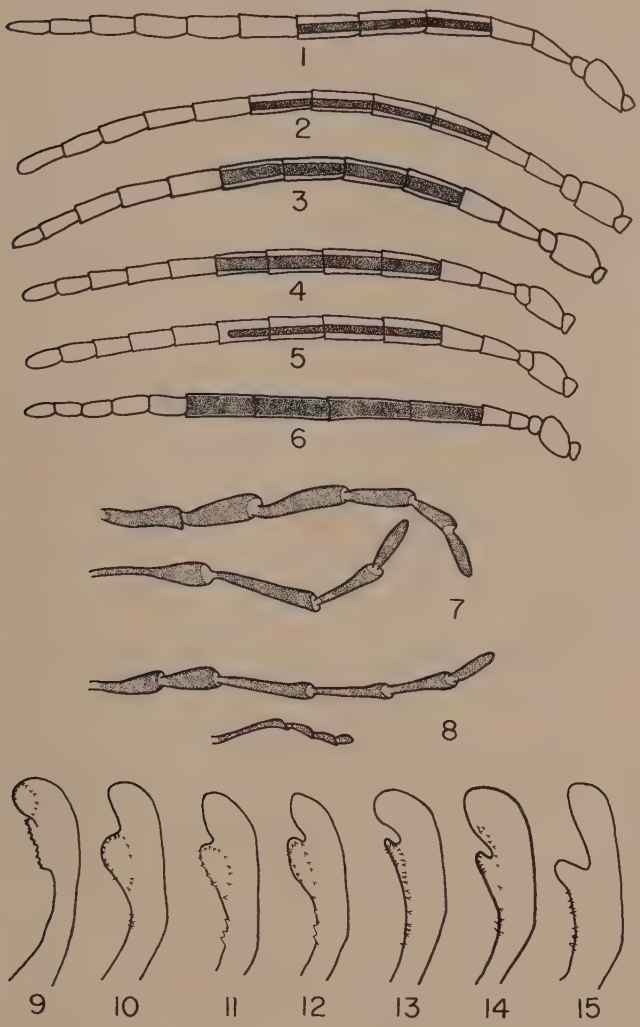
In the male genitalia the aedeagus provides the best diagnostic characters, particularly in the size and shape of the subapical lobe. The aedeagi of the seven species of our area are illustrated in figs. 9–15.

Key to the Species of North American Priononyx

1. Antennae 13-segmented, some flagellar segments with conspicuous flattened areas (fossulae) except in *ferruginea;* abdomen without sting (males) 2
– Antennae 12-segmented, flagellar segments without fossulae; abdomen with a sting ordinarily visible (females) 8
2. Abdomen black or brownish black 3
– Abdomen variously marked with red 4
3. Antennal segment VI with a broad fossula extending entire length of segment; scutum dull, individual punctures obscured by shagreening; scutellum dull ..... *atrata* (Lepeletier)
– Antennal segment VI with a narrow fossula not reaching distal end of segment; scutum partly polished, many individual punctures distinct; summit of scutellum shiny ..... *subatrata* Bohart
4. Antennal segment I much longer than third; scutum shiny in part and with numerous distinct punctures; free clypeal edge convex medially ..... *ferruginea* (Fox)
– Antennal segment I shorter than third; scutum completely shagreened or striate; free clypeal edge concave medially 5
5. Sternite VI with a broadly U-shaped median emargination 6
– Sternite VI entire medially 7
6. Antennal segments V–VIII with fossulae ..... *pubidorsum* (Costa)
– Antennal segments V–VII with fossulae ..... *canadensis* Provancher
7. Wings lightly brown-stained; scutellum low ..... *thomae* (Fabricius)
– Wings dark brown violaceous; scutellum gibbous ..... *fervens* (Linnaeus)
8. Wings lightly brown-stained at most; abdomen usually bright red 9
– Wings dark brown violaceous; abdomen black or dark red 12
9. Clypeal free edge entire medially; leg bristles pale; wings clear ..... *ferruginea* (Fox)
– Clypeal free edge notched medially; leg bristles black; wings somewhat stained 10
10. Maxillary palpus more than twice as long as labial palpus ..... *thomae* (Fabricius)
– Maxillary palpus about equal in length to labial palpus 11

Explanation of Figures

Figs. 1–6, antennae of male *Priononyx:* 1, *canadensis;* 2, *pubidorsum;* 3, *fervens;* 4, *atrata;* 5, *subatrata;* 6, *thomae. Figs.* 7–8, maxillary and labial palpi of female *Priononyx:* 7, *pubidorsum;* 8, *thomae.* Figs. 9–15, distal part of *Priononyx* male aedeagus, lateral view: 9, *ferruginea;* 10, *thomae;* 11, *pubidorsum;* 12, *canadensis;* 13, *subatrata;* 14, *atrata;* 15, *fervens.*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11. Prothoracic lobe with posterior marginal pubescence only; never more than one-half covered ..... *canadensis* Provancher
– Prothoracic lobe with pubescence more than one-half covered ..... *pubidorsum* (Costa)
12. Clypeal bristles partly pale; scutum covered with strong longitudinal striae ..... *fervens* (Linnaeus)
– Clypeal bristles black; scutum not strongly striate 13
13. Clypeus with silvery to golden appressed pubescence; scutum completely shagreened dull; scutellum not especially raised or shiny ..... *atrata* (Lepeletier)
– Clypeus with black, appressed pubescence; scutum somewhat smooth and distinctly punctured toward middle; scutellum gibbous, shiny ..... *subatrata* Bohart

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Acarina, 135, 157, 179
Acilius, 114
Acrididae, 32
Acrydium longicorne, 114
Aedipoda pellarini, 188
Aegialia blanchardi, 183
  conferta, 184
  crassa crassa, 183
  crassa insularis, 184
  lacustris, 184
  latispina, 184
  punctata, 184
Adiheterothrips, 65
Aeolothripidae, 53
Ageniella, 25
Amblyseius **similoides**, 179
Ampheremus, 178
Ananthakrishnan, new thrips, 37
Andrena (Diandrena) **macswaini**, 97
Andrenidae, 97
Andricus crystallinus, 167
Aneflomorpha **citrana**, 149
Anocha, 195, **celesteana**, 197
Anoplius, 25
Aphidae, 199
Aphodius aleutus, 184
  alternatus, 184
  caseyi, 184
  coloradensis, 184
  congregatus, 184
  consociatus, 185
  cribratulus, 185
  decipiens, 185
  denticulatus, 185
  distinctus, 185
  hamatus, 185
  inutilis, 186
  luxatus, 186
  neotomae, 186
  nevadensis, 186
  opacus, 186
  pardalis, 186
  pectoralis, 186
  phaeopterus, 186
  rectus biformis, 186
  sparsus, 187
  subaeneus, 187
  vittatus, 187
Apoidea, 97
Aporus luxus assimilis, 175, 176
  luxus luxus, 175
Argyrotaenia **beyeria**, 85
  burnsorum, 91
  cupressae, 83
  franciscana, 45
  graceana, 93
  lautana, 90
  martini, 94
  paiuteana, 87
Asilidae, 69
Astata occidentalis, 25
Atalophlebia **sepia**, 131
Attractants, light, 51
Autographa biloba, 52
  egena, 52
Baccha **myrtella**, 70
Baetisca, 102, **columbiana**, 102
Baetiscidae, 102
Bailey, thrips, 53
Belostoma angustipes, 104
Belostomatidae, 104
Belotus, 105, 112, abdominalis, 112
Bohart & Marsh, Oxybelus biology, 115
Bolitochara, 24
Bombyliidae, 118
Book notices & reviews, 30, 68, 74, 98, 104, 141, 182
Braconidae, 153
Buchelos & Pritchard, new mite, 179
Buprestidae, 178
Cantharidae, 105
Catharosia **nanella**, 118
Catocha, 195
Cecidomyiidae, 195
Cerambycidae, 149
Cerceris, 75
  acanthophila, 75, 78
  architis, 78
  argyrotricha, 75
  arno, 75
  athene, 78
  belfragei, 77, 79
  biungulata, 79
  californica, 75
  catawba, 77
  clypeata, 77
  cognata, 75
  compacta, 77
  compar, 77
  complanata, 81
  denticularis, 75
  femurrubrum, 78
  ferruginior, 75
  finitima vierecki, 80
  firma, 78
  frontata raui, 80
  fugatrix, 79
  fukaii, 80
  garciana, 75
  gnara, 78
  halone, 78
  huachuca, 75

* New names in bold face, synonyms and homonyms in italics.

imitator, 77
imitatoria, 77
interjecta, 75
luzonensis, 80
minax, 75
munda, 79
nigrescens, 79
populorum, 75
salome, 78
sayi, 79
sexta, 79
shermani, 78
solidaginis, 77
stevensi, 79
stigmosalis, 79
vanduzeei, 80
zelica, 77
zobeide, 77
zosma, 77
Cerotainiops **pritchardi**, 71
Chaetopsis fulvifrons, 117
Chant, new mites, 135
Chauliognathus, 105
Chemsak, new citrus cerambycid, 149
Chiloxanthus arcticus, 189, 190
stellatus, 189
China, Zoological nomenclature, 24, 114, 188
Chlorion, 25
Chrysididae, 191
Chrysis fuscipennis, 191
Cimicidae, 48
Cole, Diptera nomenclature, 118
Coleoptera, 15, 99, 105, 149, 178, 183
Collecting in Lower California, 42
Collections, Brazilian insect, 46
Collembola, 155
Conophthorus lambertianae, 41
Coolidge, Pacific Science congress, 14
Cophura **hurdi**, 73
Craspedomerus, 100
Crassomicrodus **muesebecki**, 153
Cuterebra latifrons, 41
Cuterebridae, 50
Cynipidae, 167
Daihiniodes **valgum**, 31
Deleatidium **vittatum**, 130
Delphax, 114
Dermaptera, 202
Dipogon calipterus nubifer, 174
diablo, 172
leechi, 171
Diptera, 67, 69, 81, 118, 143, 156, 195
Doutt, Presidential address: natural enemies & speciation, 1
Andricus heterogony, 167
Dytiscus cinereus, 114
Edmunds, mayflies, 103
Ehrlich, Liphyra brassolis, 133
Empididae, 67
Entomobryidae, 155
Entomology, Chile, 46
University of California, 48
Ephemeroptera, 102, 119
Ephydra riparia, 115
Epinotia infuscana, 45
Errata, 35, 150
Euborellia annulipes, 203
cincticollis, 203
Eucatocha, 195, **betsyae**, 195
Fauriella, 65
Fender, Cantharidae, 105
Forficula auricularia, 204
Gelechioidea, 155
Grapholitha imitativa, 45
Gryllacrididae, 31
Hedychrum, 30
Heliothis virescens, 52
zea, 52
Hemiptera, 104, 189, 197 (see also Homoptera)
Hepialus sequoiolus, 45
Herothrips, 65
Heterogony, 167
Heterothripidae, 65
Heterothrips, 65
Hippomelas, 178, brunneata, 178
californica, 178
cupreofusca, 178
cylindricollis, 178
inyoensis, 178
Holarthrothrips, 65
Holcostethus limbolarius, 28
Homoptera, 191, 199
Homothraulus missionensis, 122
montium, 123
Hoplia, 48
Hormopeza, 67
Hottes, adventive aphid, 199
Hull, new Diptera, 69
Hymenoptera, 25, 36, 75, 97, 115, 153, 167, 171, 191, 205
Ichthyurus, 105, arizonensis, 105
Ischnopoda, 24
Ixodidae, 41
Jerath, Oregon Aphodiinae, 183
Jeweley, insect, 42
Kessel, smoke flies, 67
Krantz, Acaridae, 157
Labidura riparia, 202
Lampyridae, 50
Latrodectus mactans, 30
Leech, Book notices & reviews, 30, 68, 74, 98, 104, 141
Lepidoptera, 40, 83, 133, 155, 170

Leptocimex, 48
Leptophlebiidae, 119
Linsley, Timulla mating, 36
New Diandrena, 97
Liotheum, 188
Liphyra brassolis, 133
Lycaenidae, 40, 133
Lygerus, 106
Macronema, 188
Macropsis, 114
McKenzie, new mealybug, 139
Marsh, new braconid, 153
Maruina lanceolata, 149
Mayetia, 15, **fistula**, 22
langei, 21
mendocinoensis, 15
pavitas, 22
raneyi, 20
scobina, 20
walkeri, 18
Mayetini, 15
Melanoplus **fricki**, 33
gurneyi, 34
muricolor, 33
sonomaensis, 31
Menke, Lethocerus lectotype, 104
Meromacrus **croceatus**, 69
Merothrips, 53, brevisetis, 55, 56
capensis, 55, 56
cognatus, 56
fuscipennis, 56, 57
genuinus, 55, 57
laevis, 55, 57
mirus, 55, 58
morgani, 54, 55, 56, 58
nigricornis, 55, 60
productus, 55, 60
tympanis, 55, 62
williamsi, 56, 62
Metopia leucocephala, 29
sp. near inermis, 29
Metriona bicolor, 46
Microsania, 67
Mitoura spinetorum, 40
Moore, exotic staphylinid, 99
Motes, 25
Mouralia tinctoides, 52
Museum, European, 47
Myrmosa bradleyi, 29
Nanularia, 178
Nelson & Barr, buprestid synonymy, 178
Nematoda, 24
Neocatocha, 195
Nirmides, 188
Noctuidae, 51
flower visiting habits, 51
Nomadopsis, 25
Nutting, adventive Arizona earwigs, 202
Obituary notice, 151
Oligothrips, 62, 65, oreios, 64
Opisthothrips, 65
Opostega sp. near nonstrigella, 170
Opostegidae, 170
Orthoptera, 31
Oxybelus sericeum, 115
Pacific Coast Ent. Soc., Field trip, 47
Proceedings, 41
Pacific Insects, a new entomological journal, 30
Papilio dardanus, 114
Papilionoidea, 133
Paracraspedomerus, 99
Paratriatoma hirsuta, 197
Parker, Prononyx synopsis, 205
Pediculus dentatus, 188
Pericoma lassenica lassenica, 143
kincaidi, 143
scotiae, 143
sicula, 144
Perillus bioculatus, 28
Perissothrips parviceps, 37
Philosepedon interdicta, 148
Phytoseiidae, 135, 179
Platypezidae, 67
Pleurophorus caesus, 187
Pompilidae, 171
Pompilus phoenix, 177
Powell, new moths, 83
introduced moths, 155
book review, 182
Powell & Burdick, Astata nesting behavior, 25
Prononyx atrata, 206
canadensis, 206
ferruginea, 206
fervens, 206
pubidorsum, 206
subatrata, 206
thomae, 206
Pritchard, catochine gall midges, 195
Promecopsis, 114
Protemnothrips, 65
Psammodius caelatus, 187
oregonensis, 187
Pselaphidae, 15
Pseudaletia unipuncta, 52
Pseudococcidae, 139
Pseudocraspedomerus, 101
Psychoda minuta, 148
pusilla, 148
rarotongensis, 148
setigera, 147
trinodulosa, 148

Psychodidae, 143, 156
Quate, Nearctic Psychodidae, 143
  psychodid synonymy, 156
Reduviidae, 197
Resistance, insect, 49
Rhizoecus **boharti**, 139
Rhizomaria piceae, 199
Rhopalandrothrips, 37, key 39
  annulicornis, 39
  consociatus, 39
  corni, 39
  nilgiriensis, 37, 39
  ricini, 39
Rosenstiel, gooseberry miner, 170
Ross, bat flies, 81
Ryckman & Olsen, Mexican Paratriatoma record, 197
Saldidae, 189
Sarcoptiformes, 157
Scarabaeidae, 183
Schuster, Marsh, and Park, Mayetini, 15
Scullen, Cerceris synonymy, 75
Senotainia litoralis, 29, 117
Smokeflies, 67
Southernia, 24
Speciation, 1
Sphecidae, 25, 75, 205
Sphex, 25
Stage, chrysidid host record, 191
Staphylinidae, 99
Streblidae, 81
Strohecker, New Orthoptera, 31
Swezey, Otto Herman, 151
Symmoca signatella, 155
Syrphidae, 69
Tachinidae, 51
Tachyusa, 24
Tanytarsus, 114
Tastiotenia festiva, 177
Telmatoscopus furcatus, 146
  latipennis, 144
  macdonaldi, 146
  nebraskensis, 146
  niger, 156
  patibulus, 146
  snowhilli, 156
  spinitibialis, 156
  subtilis, 144
  superbus, 146
  varitarsis, 144
Thereva *nana*, 118
Therevidae, 118
Thew, Neotropical mayflies, 119
Thraulodes **daidaleus**, 119
  traverae, 120
Threticus bicolor, 148
  jonesi, 148
Thyanta brevis, 28
  pallidovirens pallidovirens, 28
  punctiventris, 28
Thysanoptera, 37, 54
Tilden, Mitoura spinetorum, 40
Tipula oleracea group, 114
Tomolonus reductus, 155
Tortricidae, 45, 83
Traverella, 122
  albertana, 122
  bellus, 122
  bradleyi, 122, 123
  erhardti, 122, 123
  maculipennis, 122
  roundsi, 122, 123
Trichobius sphaeronotus, 81
Trichomyia nuda, 143
  wirthi, 143
Trichopepla ?aurora, 28
Trichoplusia ni, 52
Trimerotropis **helferi**, 32
Tritozyga, 195
Trypherus, 105, 106
  blaisdelli, 106, 107
  frisoni, 106, 110
  latipennis, 106, 108
  pauperculus, 106
Typhlodromus (Amblyseius) **newelli**, 135
  palustris, 136
Ulmeritus, 123, **adustus**, 126
  balteatus, 124
  patagiatus, 128
Usinger, Arctic saldid biology, 189
Usinger & Zimmerman, Swezey obituary, 151
Villa *arenicola*, 118
  lateralis arenicola, 118
  psamminus, 118
Wasbauer, spider wasp taxonomy, 171
Wilkey, Collembola eye number, 155
Xystrocera globosa, 45
Zoological nomenclature, 24, 114, 188